

TRAINING MANUAL

LCD DIRECTVIEW TELEVISION - 2006



LG Service

Digital Display

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Customer Service (and Part Sales): 1-800-243-0000

Technical Support (and Part Sales): 1-800-847-7597

USA Website: www.lgusa.com

Customer Service Website: us.lgservice.com

B2B Service Website: aic.lgservice.com

Training Website: www.LGCSAcademy.com

IMPORTANT SAFETY NOTICE

This manual was prepared for use only by properly trained audio-visual service technicians. When servicing this product, under no circumstances should the original design be modified or altered without permission from LG Electronics. Unauthorized modifications will not only void the warranty, but may lead to property damage or user injury. All components should be replaced only with types identical to those in the original circuit and their physical location, wiring, and lead dress must conform to original layout upon completion of repairs. If any fuse (or Fusible Resistor) in this TV receiver is blown, replace it only with the factory specified fuse type and rating. When replacing a high wattage resistor (Oxide Metal Film Resistor, over 1W), keep the resistor 10mm away from PCB. Always keep wires away from high voltage or high temperature parts. Do not attempt to modify this product in any way.

Special components are also used to prevent shock and fire hazard and are required to maintain safe performance. No deviations are allowed without prior approval by LG Electronics. Service work should be performed only after you are thoroughly familiar with these safety checks and servicing guidelines. Circuit diagrams may occasionally differ from the actual circuit used. This way, implementation of the latest safety and performance improvement changes into the set is not delayed until the new service literature is printed.

GENERAL SAFETY GUIDANCE

An Isolation Transformer should always be used during the servicing of a receiver whose chassis is not isolated from the AC power line. Use a transformer of adequate power rating to protect against personal injury from electrical shocks. It will also protect the receiver and its components from being damaged by accidental shorts of the circuitry that may be inadvertently introduced during the service operation. Before returning the receiver to the customer, always perform an AC leakage current check on the exposed metallic parts of the cabinet, such as antennas, terminals, etc., to be sure the set is safe to operate without damage of electrical shock.

With the instrument AC plug removed from AC source, connect an electrical jumper across the two AC plug prongs. Place the AC switch in the on position, connect one lead of ohm-meter to the AC plug prongs tied together and touch other ohm-meter lead in turn to each exposed metallic parts such as antenna terminals, phone jacks, etc. If the exposed metallic part has a return path to the chassis, the measured resistance should be between 1M Ω and 5.2M Ω . When the exposed metal has no return path to the chassis the reading must be infinite. Any other abnormality that exists must be corrected before the receiver is returned to the customer.

ELECTROSTATICALLY SENSITIVE DEVICES

Some semiconductor (solid-state) devices can be damaged easily by static electricity. Such components commonly are called Electrostatically Sensitive (ES) Devices. Examples of typical ES devices are integrated circuits and some field-effect transistors and semiconductor "chip" components. The following techniques should be used to help reduce the incidence of component damage caused by static electricity.

Immediately before handling any semiconductor component or semiconductor-equipped assembly, drain off any electrostatic charge on the body by touching a known earth ground. Alternatively, obtain and wear a commercially available discharging wrist strap device, which should be removed for potential shock reasons prior to applying power to the unit under test. After removing an electrical assembly equipped with ES devices, place the assembly on a conductive surface such as an ESD mat, to prevent electrostatic charge buildup or exposure of the assembly. Use only a grounded-tip soldering iron to solder or unsolder ES devices. Use only an anti-static solder removal device. Some solder removal devices not classified as "anti-static" can generate electrical charges sufficient to damage ES devices. Do not use freon-propelled chemicals which can generate electrical charge sufficient to damage ES devices. Do not remove a replacement ES device from its protective package until immediately before you are ready to install it. Minimize bodily motions when handling unpackaged replacement ES devices (Otherwise, seemingly harmless motion, such as the brushing together of your clothing or the lifting of your foot from a carpeted floor, can generate static electricity sufficient to damage an ES device).

REGULATORY INFORMATION

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures: Reorient or relocate the receiving antenna; Increase the separation between the equipment and receiver; Connect the equipment into an outlet on a circuit different from that to which the receiver is connected; Consult the dealer or an experienced radio/TV technician for help.

The responsible party for this device's compliance is:

LG Electronics of Alabama, Inc.

201 James Record Road

Huntsville, AL 35824, USA

Digital TV Hotline: 1-800-243-0000

TABLE OF CONTENTS

OVERVIEW	5	TV GUIDE	82
INTRODUCTION	5	OVERVIEW	82
MOUNTING INTERFACE	5	OPERATION	82
COMPUTER CONNECTION	6	SYSTEM INFO	83
REMOTES	6	SYSTEM FLOWCHART	85
TERMINOLOGY	7		
VIEWING ANGLE	7		
IPS (IN-PLANE SWITCHING)	7		
PEAK BRIGHTNESS	7		
CONTRAST RATIO	7		
RESPONSE TIME	7		
A/V CONNECTIONS	8		
THEORY	9		
LIQUID CRYSTALS	9		
LIQUID CRYSTAL DISPLAY	9		
LIQUID CRYSTAL PANEL	10		
LCD VERSUS CRT	11		
LCD VERSUS PLASMA	11		
MODEL OVERVIEW	12		
MODEL NUMBERS	12		
MODEL DESCRIPTIONS	15		
CIRCUIT DESCRIPTIONS	20		
15" CIRCUIT DESCRIPTIONS (L15V26)	20		
30" CIRCUIT DESCRIPTIONS (L30W26)	23		
32" CIRCUIT DESCRIPTIONS (CABLECARD MODELS)			
28			
FIRMWARE UPDATES	33		
FIRMWARE UPDATES VIA MEMORY CARD	33		
DISASSEMBLY	37		
SMALL SCREEN MODELS	37		
LARGE SCREEN MODELS - PART 1	37		
LARGE SCREEN MODELS - PART 2	39		
EXPLODED VIEWS	40		
CABLECARD	62		
DIGITAL CABLE READY (DCR)	62		
CEA-NCTA AGREEMENT	62		
TERMS	63		
VENDORS	63		
DCR ARCHITECTURE	64		
HOST-CABLECARD INTERFACE	64		
IN-BAND/OOB SPECIFICATION	66		
CABLE MENU & MMI	67		
DIGITAL CERTIFICATES DATA	70		
CABLECARD RESET	70		
EAS (EMERGENCY ALERT SYSTEM)	70		
HOST DIAGNOSTICS	71		
ERROR REPORTING	71		
CABLE CARD TROUBLESHOOTING	72		
IN-HOME TROUBLESHOOTING	77		
CABLECARD TROUBLESHOOTING	80		

OVERVIEW

INTRODUCTION

All LCD TV models are module level repair in and out of warranty. They are covered by a one year parts and labor warranty. For service, the end user should call 1-800-243-0000 for complete shipping and handling instructions. Refer to the last page of the owner's manual for more warranty information. For models under 30", the Service Level is Factory Service Repair. Larger models are Field Service. Although, warranty repair by an ASC is approved in certain situations for smaller screen models. Contact the LG Warranty department for more information.



Most models are similar in function and internal layout with the exception of models over 23". For example, the 30" inch LCD has more fluorescent lamps than normal (16 lamps) and some additional user functions.

Note that not all models support HDTV (High Definition Television). The 10", 13", and 20" models do not support HDTV, but 20" models do support EDTV (Enhanced Definition Television). The section on Models has more information about the specifications of each model.

MOUNTING INTERFACE

The Video Electronics Standards Association (VESA) Flat Display Mounting Interface Standard (FDMI) outlines mounting interface standards for flat-panel displays. VESA FDMI Standards are 75 x 75 mm, 100 x 100 mm, and 100 x 200 mm mounting hole pattern with 4, 4 mm x 10 mm screws. Most new models feature a VESA mount, except large screen models. Large screen models use mounting hole patterns similar to PDPs.

75MM MOUNT

10" Models

100MM MOUNT

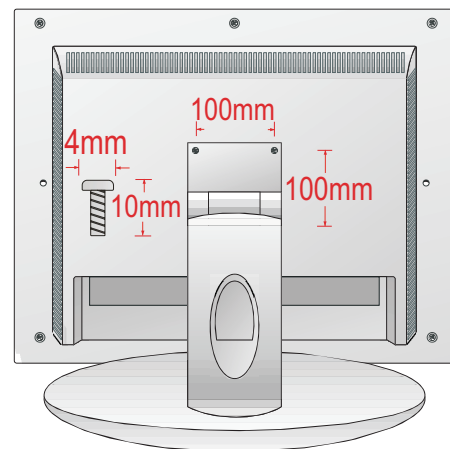
13" to 23"

200MM MOUNT

26" to 32" Models

NO VESA MOUNT

37, 42, & 55" models



OVERVIEW

COMPUTER CONNECTION

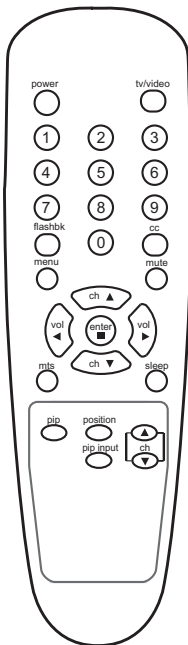
Most models except the 10", 13", and 20" support computer video. Set the monitor output resolution and vertical frequency on the PC before connecting to the TV (see table). Connect the TV to the computer with a VGA cable. Connect the computer's audio output to the TV's PC SOUND input.

The TV has been pre-adjusted to use XGA 1024x768, 60Hz format. If possible, use one of the XGA formats to obtain the best image quality for your TV/LCD monitor. LCD monitors should be used at their native (normally their max) resolution. If set up under other resolutions, a slightly distorted picture may appear on the screen. If the message "OUT OF RANGE" appears on the screen, adjust the PC output to a format listed in the chart.

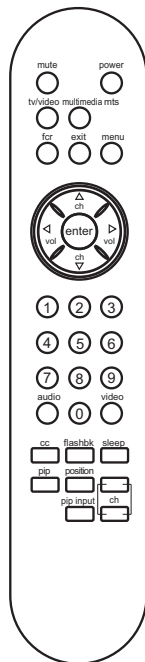
Computer Video Modes			
Mode	Resolution	Horizontal Frequency (KHz)	Vertical Frequency (KHz)
VGA	640x400	31.5KHz	70Hz
	640x400	37.9KHz	85Hz
	640x480	31.5KHz	60Hz
	640x480	35.0KHz	67Hz
	640x480	37.9KHz	72Hz
	640x480	37.5KHz	75Hz
	640x480	43.3KHz	85Hz
	720x400	31.5KHz	70Hz
SVGA	800x600	35.2KHz	56Hz
	800x600	37.9KHz	60Hz
	800x600	48.1KHz	72Hz
	800x600	46.9KHz	75Hz
	800x600	53.7KHz	85Hz
(MAC)	832x624	49.7KHz	75Hz
XGA	1024x768	48.4KHz	60Hz
	1024x768	56.5KHz	70Hz
	1024x768	60.2KHz	75Hz
	1024x768	68.67KHz	85Hz

REMOTES

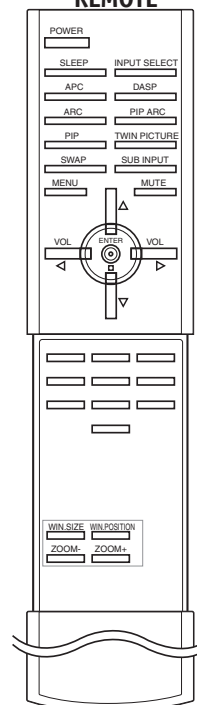
2001/2002
SMALL SCREEN MODELS



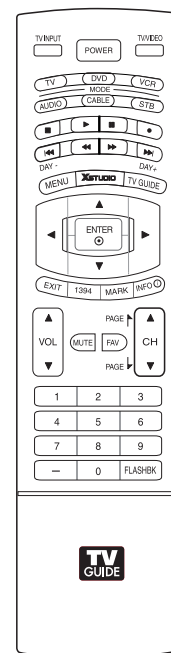
2003+
SMALL SCREEN MODELS



30" LCD STYLE
REMOTE



2005+
LARGE SCREEN MODELS



TERMINOLOGY

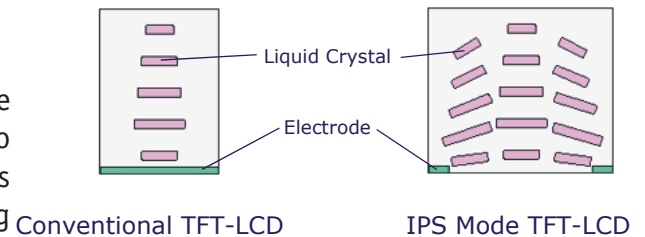
This section explains some of the terminology used with LCD TVs.

VIEWING ANGLE

Viewing angle is the angle at which the display's brightness begins to noticeably diminish. Viewing angle used to be a major factor when choosing an LCD but they have improved enough on current models that it is not an issue anymore. This is due to advancements like In-Plane Switching, High-efficiency Backlights, and reflective Polarizers. Some smaller screen LCDs (under 15") may still have limited viewing angles to keep costs down.

IPS (IN-PLANE SWITCHING)

In-Plane Switching provides more control over the Liquid Crystals in an LCD. It uses an electric field to line up the Liquid Crystals in an arc formation. This directs light out at angles which improves the viewing angle.



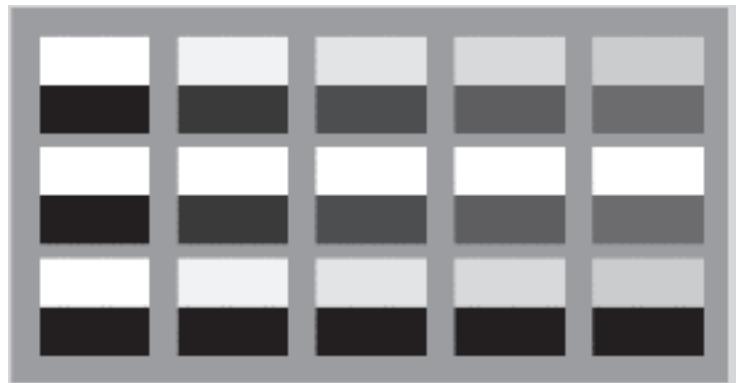
PEAK BRIGHTNESS

Peak brightness is the maximum amount of brightness that a display can produce. It is often measured in candella per square meter (cd/m²). Most LG and Zenith LCDs are 400-450 cd/m².

CONTRAST RATIO

Contrast Ratio is the ratio of a display's brightest white to its darkest black. Higher Contrast Ratios are better and will allow a TV to reproduce a more realistic picture and make text easier to read. One of the limitations of LCDs has been contrast ratio.

With recent improvements, our LCD TVs have a contrast ratio up to 450:1.



RESPONSE TIME

The speed at which the pixels can react or change. Slower response times can cause fast moving video to "ghost" or distort because the scene changes faster than the LCD can display the video (especially with video games). Response times of new LCDs isn't a factor for most uses, but older models could experience noticable ghosting due to slower response times.

TERMINOLOGY

A/V CONNECTIONS

Below are connections you may find on LCD TVs. SD = Standard Definition and HD = High Definition.



Composite

Normally labeled "Composite" and/or "Video". SD Only.



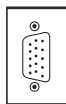
S-Video

Super Video. Normally labeled "S-Video". SD Only. A little better quality than Composite.



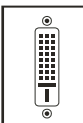
Antenna

Normally labeled "Antenna". Supports HD. A.k.a. Coax, Cable.



VGA

Normally labeled "RGB" and/or "PC/DTV". Supports HD.



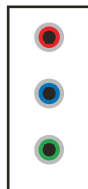
DVI

Normally labeled "DVI", "PC/DTV", or "HDMI". Digital instead of analog (Digital version of VGA). Supports HD.



HDMI

Normally labeled "HDMI". Newer version of DVI. Supports HD and Digital Audio.



Component Video

Normally labeled "Component/DTV/DVD". Supports HD.



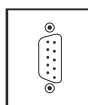
Digital Audio

Normally labeled "Digital Audio (coaxial)". Better quality than normal audio. Supports Surround Sound.



Optical Audio

Normally labeled "Digital Audio (optical)". Better quality than normal audio. Supports Surround Sound. Uses a fiber optic cable.



RS-232

Normally labeled "Calibration Port", "Service Port", and/or "RS-232". A.k.a. serial port. Used for uploading firmware or external control of the unit (no video or audio).



IEEE 1394

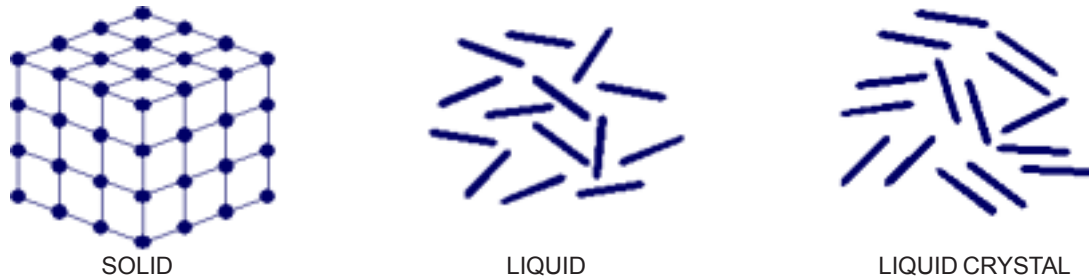
Normally labeled "IEEE 1394" or "DTV Link". Supports HD and Digital Audio.

THEORY

This section covers what Liquid Crystals are and how an LCD Display works.

LIQUID CRYSTALS

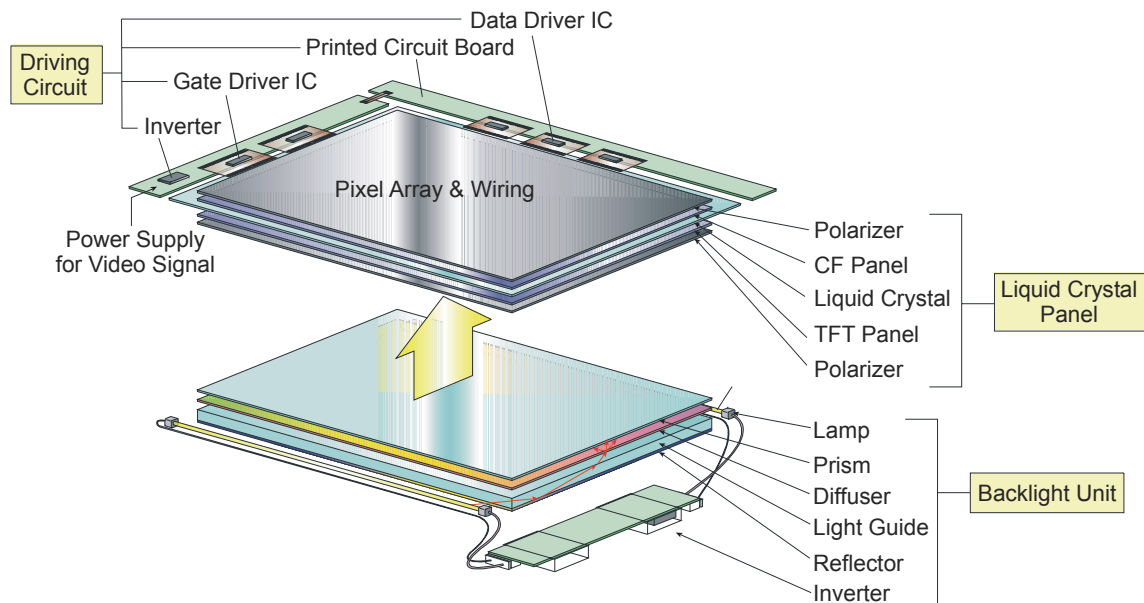
In school you learned that matter has three distinct states; solid, liquid, and gas. However, there are states of matter that may fall between these states, like liquid crystals. Basically they are crystals that hold their orientation (shape) but can flow similar to liquids. Their molecules point in same direction with respect to each other like in a solid, but they are free to change position like in a liquid. Think of a handful of pencils. They collectively hold their shape at rest, but change shape when you squeeze or let go of them.



There are different phases and types of liquid crystals that perform differently. Small amounts of pressure, heat, and/or electricity can cause liquid crystals to change in some way. For LCDs we are interested in the electricity aspect, but pressure and heat are side effects that have to be dealt with. This is why LCDs have a limited operating range and distort when you press on the screen.

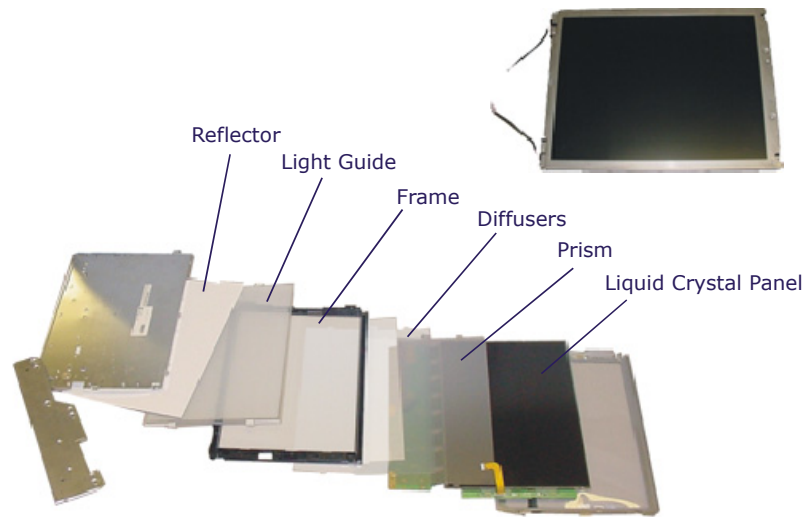
LIQUID CRYSTAL DISPLAY

A Liquid Crystal Display is composed of a light source (backlight), a Liquid Crystal Panel, and a driving circuit. We start with a light source at the back of the panel composed of thin fluorescent bulbs (CCFLs - Cold Cathode Fluorescent Lamps). This light passes through filters to help create a uniform light source. Then the light passes through the Liquid Crystal Panel which is composed of thousands of pixels that control the flow of light through the panel to make images.



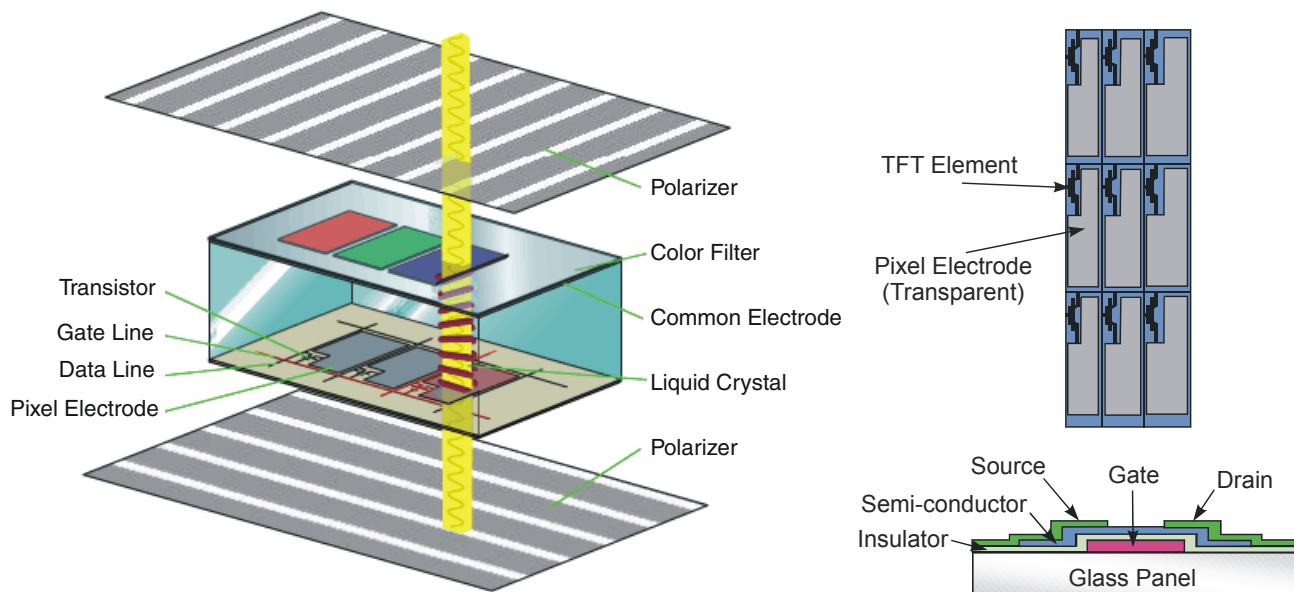
THEORY

An LCD panel from a 15" LCD TV.



LIQUID CRYSTAL PANEL

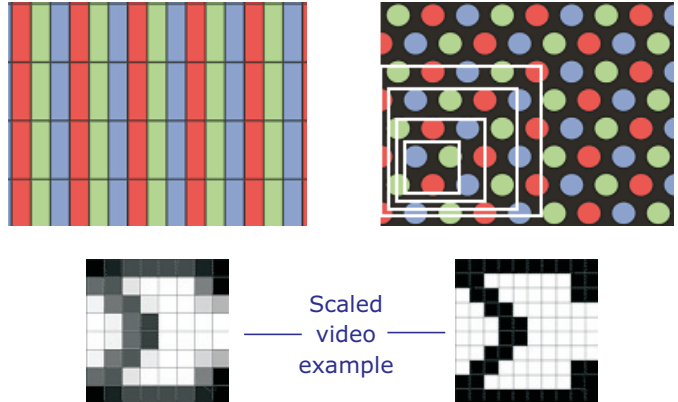
Below (on the left) is a cross section of a liquid crystal panel. The key to an LCD's operation is the polarizers. The polarizers only allow a certain wavelength of light to pass through. The two polarizers are mounted at a 90 degree angle with respect to each other, which prevents light from passing through. The liquid crystals are used to twist the light beam 90 degrees and allow light to pass through that cell. Color comes from a simple light filter.



Each sub-pixel or cell (a red, green, and blue sub-pixel equals one pixel) is controlled by a Thin Film Transistor (TFT). This provides accurate control of each cell and makes for an accurate picture. Some methods used in the past that didn't involve a switch and current could leak to surrounding cells resulting in a blurred image. A TFT is a semiconductor (bottom-right picture), it behaves like a relay switch.

LCD VERSUS CRT

One disadvantage LCDs have is having fixed pixels which makes it more difficult to scale video than a CRT. A CRT can change the pixel size by adjusting the size of the beam, LCDs use a processor called a Scalar. LCDs feature their best picture quality at their native resolution (or max res) and CRTs feature good quality at any resolution up to their maximum resolution.



LCD ADVANTAGES OVER CRT

- Uses less power
- Less heat output
- Smaller and lighter
- Unaffected by Magnetic Fields



CRT ADVANTAGES OVER LCD

- Better scaling
- Less expensive

LCD VERSUS PLASMA



LCD ADVANTAGES OVER PLASMA

- Uses less power
- Smaller and lighter
- Replaceable backlight



PLASMA ADVANTAGES OVER LCD

- Less expensive (for same screen size)
- Brighter
- Better contrast

MODEL OVERVIEW

This section covers some of the past and present LG and Zenith LCD TVs. Most LCD TVs feature similar features and specifications. They support High Definition and computer input, except for the 10", 13", 20", and the wireless 15" models. The 2005 models 26" and larger have built-in ATSC tuners and support CableCARD™. Note that Commercial models don't have CableCARD™ support since it is not needed in a distribution network.

KEY TERMS

SDTV - Standard Definition (480i).

EDTV - Enhanced Definition (480p).

HDTV - High Definition (720p, 1080i).

XD Engine™ - Six distinct processes contribute to picture improvement.

CableCARD™ - Decoder card for digital cable.

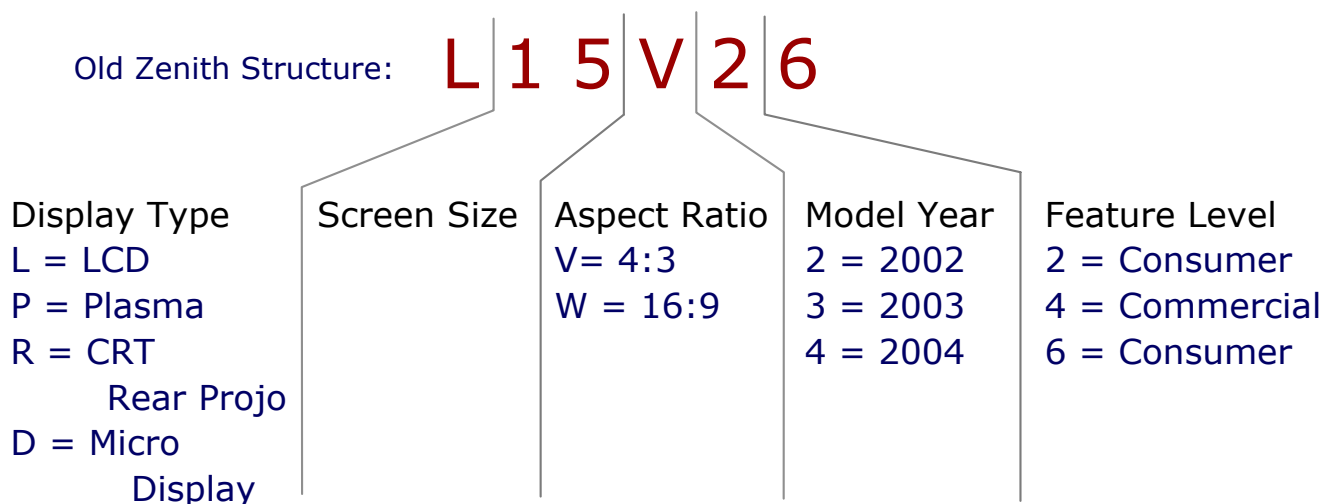
HDMI - High Definition Multimedia Interface. Alternative to DVI. Smaller connector and supports audio.

HDCP - High-bandwidth Digital Content Protection.

MODEL NUMBERS

OLDER ZENITH PRODUCTS (02-04)

Old Zenith Structure:



MODELS

OLDER LG PRODUCTS

Old LG Structure: **M U - 5 0 P Z 9 0 V**

Product Type

M = Monitor
D = ATSC Tuner
K = DVD Player
R = NTSC Tuner
T = DVR

Region

U = North America
Z = Europe
T = NA & EU
P = South America
J = Japan
N = Korea

Screen Size

Display Type

F = Flat CRT
L = LCD
P = Plasma
S = Micro Display

Aspect Ratio

A B C = 4:3
X Y Z = 16:9

Options

H = High Altitude
V = Pivot
M = Altitude & Pivot
Q = Home Security Network
D = DLP
L = LCD

Feature Level

CURRENT LG/ZENITH PRODUCTS

Current (2005) LG & Zenith Structure:

6 0 P Y 2 D R

Brand

Z = Zenith
Blank = LG

Screen Size

Display Type

F = Flat CRT
L = LCD
P = Plasma
S = Micro Display

Feature

A = 4:3
P = 16:9
X Y Z = 16:9
L = LCOS
S = Slim
W = Wireless

Product Type

R = NTSC Tuner
D = ATSC Tuner
M = No tuner

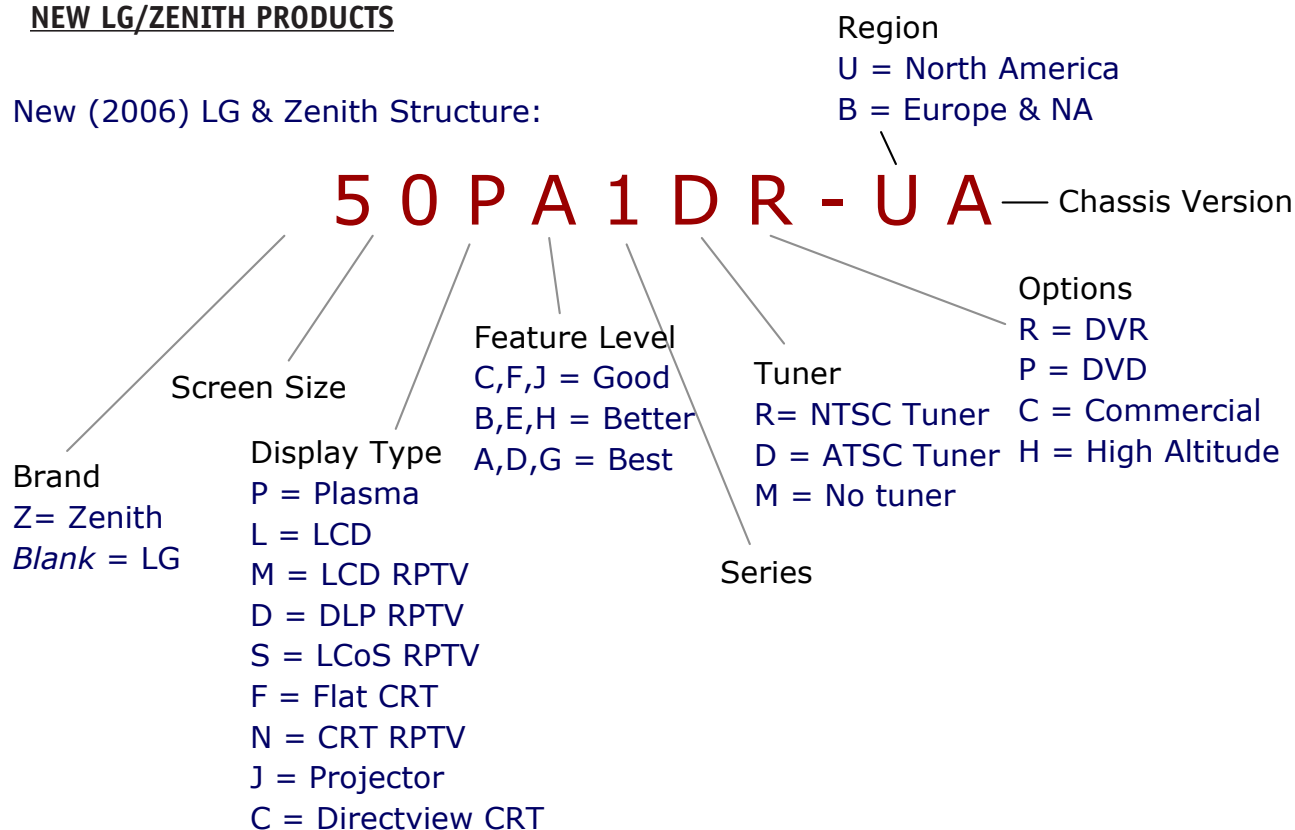
Series

Options

R = DVR
V = DVD
C = Commercial

NEW LG/ZENITH PRODUCTS

New (2006) LG & Zenith Structure:



MODEL NUMBER OVERVIEW

The exception to the model rules on the previous pages are the ZLD models and a couple of special commercial models. The ZLD models are our original/oldest LCD TVs and there are two 15" models and one 20" model that use this nomenclature.

You should now be able to determine the approximate age of an LCD TV by its model number. Below is an example using 15" LCD TVs.

New Models (2006): 15LC1R

Current models (2005): 15LA6R and Z15LA7R

Older models (2003-2004): RU-15LA61 and L15V36

Older models (2002-2003): L15V26

Original Model (1999-2002): ZLD15A1

MODELS

MODEL DESCRIPTIONS

10" MODELS

The 10" models do not support HDTV and don't support computer input like most LCDs. The new V34 models are commercial models. They feature an MPI/RF card like some of the CRT commercial sets and also offer an optional RS-232 add-on card. The V22 has component inputs, but the V34 does not.



ZENITH L10V22
Brightness - 200 cd/m2
Contrast Ratio - 250:1
Viewing Angle - 90° x 90°



ZENITH L10V34H
ZENITH L10V34S
Brightness - 350 cd/m2
Contrast Ratio - 180:1
Viewing Angle - 120° x 95°

13" MODELS

The L13V36 is an standard definition TV and has a resolution of 640x480 and features the new brighter LCD panel technology. It accepts component input but does not accept computer input.



ZENITH L13V36
LG RU-13LA60
Type - SDTV
Resolution - 640 x 480
Viewing Angle - 140° x 120°

15" MODELS

All 15" models support HDTV, computer input (VGA), and have the basic features that a normal TV would have (e.g. v-chip, stereo, trilingual menus, on/off timer, closed captions). They have a built-in NTSC tuner but no ATSC tuner. The L15V26, ZLD15A1b, and L15V36 feature picture-in-picture. Note that PIP on these models only works in PC mode (main source set to RGB-PC).

The L15V26C has 120V power input instead of 12V. The power supply is located inside the TV instead of being external like the 12V versions. The V24S model is a commercial model that features RS-232 input and has no component inputs (removed to make room for the RS-232 input). The L15V36 features an improved LCD display panel featuring Super IPS Technology. It is brighter, has a larger viewing angle, and a higher contrast ratio than previous models.

OLDER ← → NEWER

ZENITH
MODELS



ZLD15A1
ZLD15A1b



L15V26
L15V26B
L15V26C
L15V26D



L15V24S



L15V36



Z15LA7R

LG
MODELS



RU-15LA61



15LA6R



15LW1R Wireless TV



15LC1RB

17" MODELS

The 17" widescreen models feature 1280 x 768 WXGA Resolution and support for HDTV. They also feature Super IPS Technology which allows for distortion-free viewing from almost any angle. In addition to normal A/V inputs, they feature one VGA input (no DVI). The L17W36DVD is the same as L17W36 but features a built-in slot load DVD player mounted vertically behind the screen. The commercial model (RU-17LZ50C) features RS-232.



ZENITH
L17W36
L17W36DVD (built-in DVD)



LG
RU-17LZ22
KU-17WDVD (built-in DVD)



LG
17LX1R



ZENITH Z17LZ5R
LG RU-17LZ50C

20" MODELS

The 20" models do not support HDTV. They will accept EDTV input (480p) and have component inputs. They have no VGA connector like most LCDs.

ZENITH
MODELS



ZLD20A1



L20V26
L20V26C
HCL20A12



L20V36



Z20LA7R



L20V34

LG
MODELS



RU-20LA61
RU-20LZ61



20LA6R

MODELS

23" MODELS

The 23" widescreen models have the same features as the 17" models including 1280 x 768 WXGA resolution. They also feature Super IPS Technology which allows for distortion-free viewing from almost any angle. The two on the right feature DVI w/ HDCP and RS-232 the other two have RGB (VGA) and no RS-232.



ZENITH L23W36



LG RU-23LZ21



23LX1R/2R
23LX1RV (BUILT-IN DVD)



Z23LZ5R
RU-23LZ50C

26/27" MODELS

Z26LZ5R
L27W46
RU-27LZ50C
1280 x 768p
176° x 176°
NTSC Tuner
DVI with HDCP
RS-232



LG 26LX1D/2D
1366 x 768p Resolution
1200:1 Contrast Ratio
NTSC/ATSC/QAM w/CableCARD
HDMI with HDCP
IEEE 1394 w/ DTV link
Memory Card Reader
TV Guide On Screen®
RGB (VGA) & RS-232
XD Engine™

30" MODELS

The 30" widescreen models support HDTV and feature RS-232. The L30W36 does not have a built-in tuner.

Type - HDTV
Resolution - 1280 x 768 (16:9)
Viewing Angle - 176° x 176°
DVI & VGA
RS-232



ZENITH	LG
L30W26	MW-30LZ10
L30W36	MW-30LZ12

LG RU-30LZ50C
NTSC TUNER
DVI
RS-232



LG DU-30LZ30
ATSC TUNER
VGA & DVI
RS-232



32" MODELS

Zenith
Z32LZ5R
LG
RU-32LZ50C



1366 x 768p Resolution
1200:1 Contrast Ratio
NTSC Tuner
DVI with HDCP
RGB (VGA) & RS-232

32LP1D



1366 x 768p Resolution
1200:1 Contrast Ratio
NTSC/ATSC/QAM w/CableCARD™
HDMI with HDCP
IEEE 1394 w/ DTV link
Memory Card Reader
TV Guide On Screen®
RGB (VGA) & RS-232
XD Engine™

32LX1D/2D



37" MODELS

LG DU-37LZ30
1366 x 768p Resolution
1000:1 Contrast Ratio
NTSC/ATSC/QAM
DVI with HDCP
XD Engine™
RGB (VGA) & RS-232



LG 37LC2D
1366 x 768p Resolution
1600:1 Contrast Ratio
NTSC/ATSC/QAM
HDMI with HDCP
XD Engine™
RGB (VGA) & RS-232



MODELS

42" MODELS



LG DU-42LZ30
1366 x 768p Resolution
1000:1 Contrast Ratio
NTSC/ATSC/QAM
DVI with HDCP
RGB (VGA) & RS-232
XD Engine™



LG 42LP1D
1366 x 768p Resolution
1200:1 Contrast Ratio
NTSC/ATSC/QAM w/CableCARD™
HDMI with HDCP
RGB (VGA) & RS-232
Memory Card Slot
XD Engine™



LG 42LB1DR
Built-in DVR (160GB)
1366 x 768p Resolution
1600:1 Contrast Ratio
NTSC/ATSC/QAM w/CableCARD™
HDMI with HDCP x2
RGB (VGA) & RS-232
XD Engine™

55" MODEL

LG 55LP1M



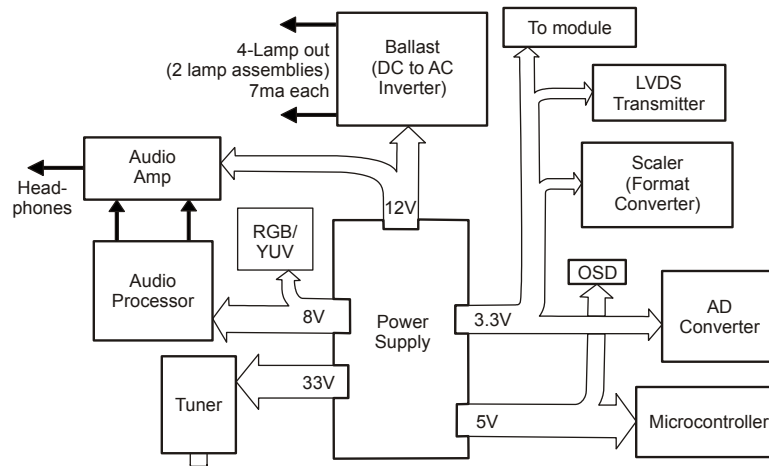
1920x1080p Resolution
1200:1 Contrast Ratio
NTSC/ATSC/QAM
HDMI with HDCP
RGB (VGA) x2 & RS-232

CIRCUIT DESCRIPTIONS

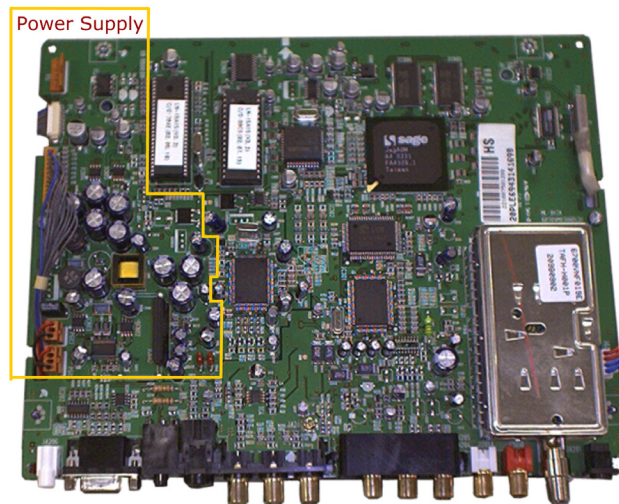
15" CIRCUIT DESCRIPTIONS (L15V26)

15" POWER SUPPLY

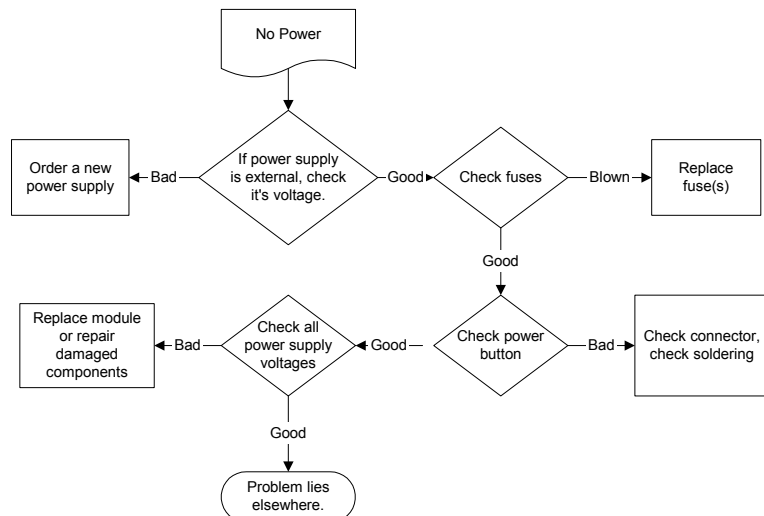
FLOWCHART



PCB



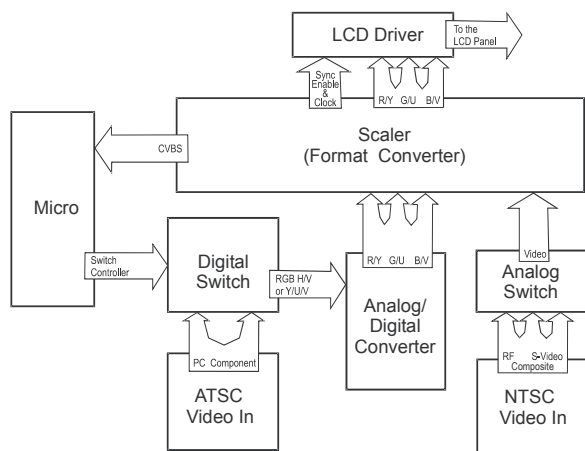
TROUBLESHOOTING DIAGRAM



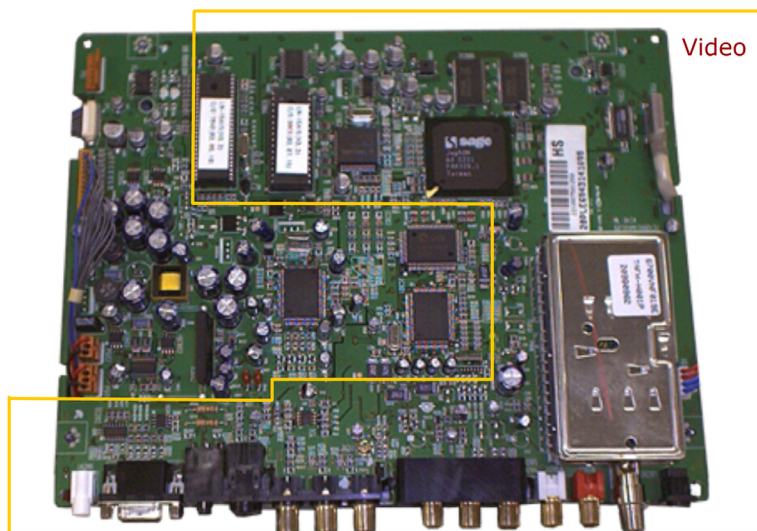
CIRCUIT DESCRIPTIONS

15" VIDEO

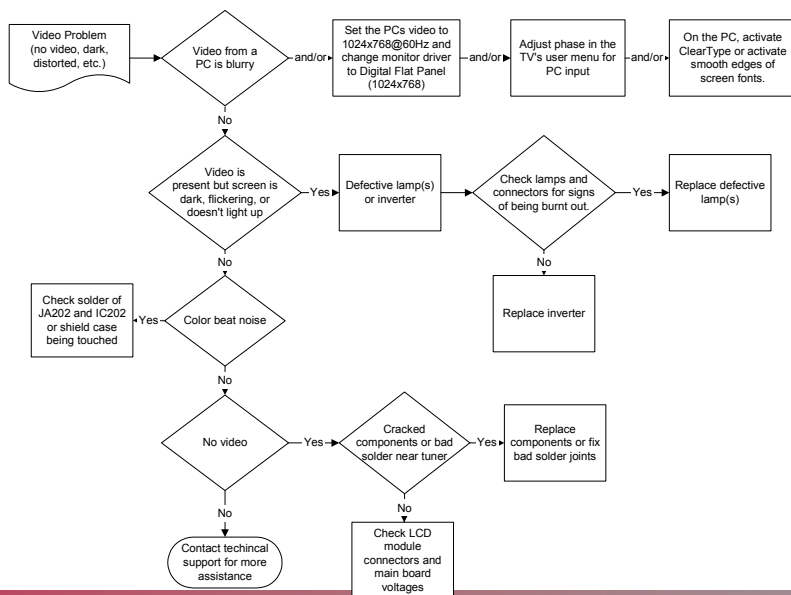
FLOWCHART



PCB

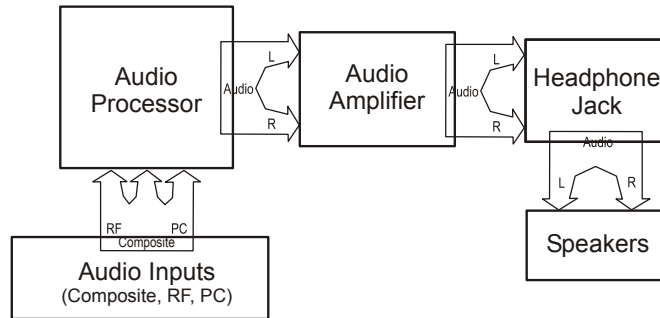


TROUBLESHOOTING DIAGRAM

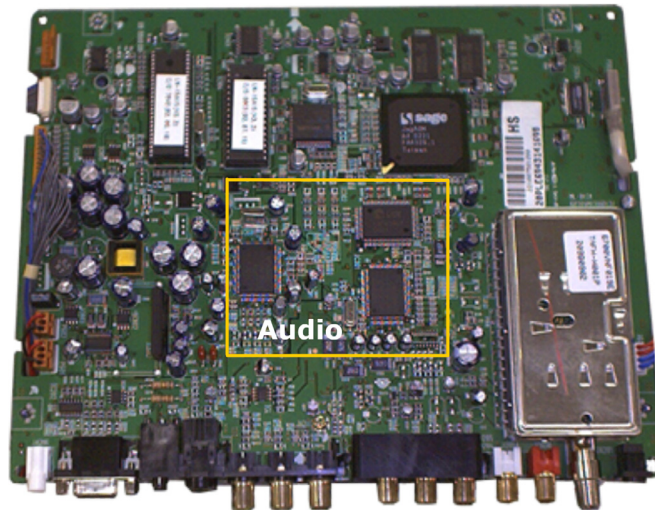


15" AUDIO

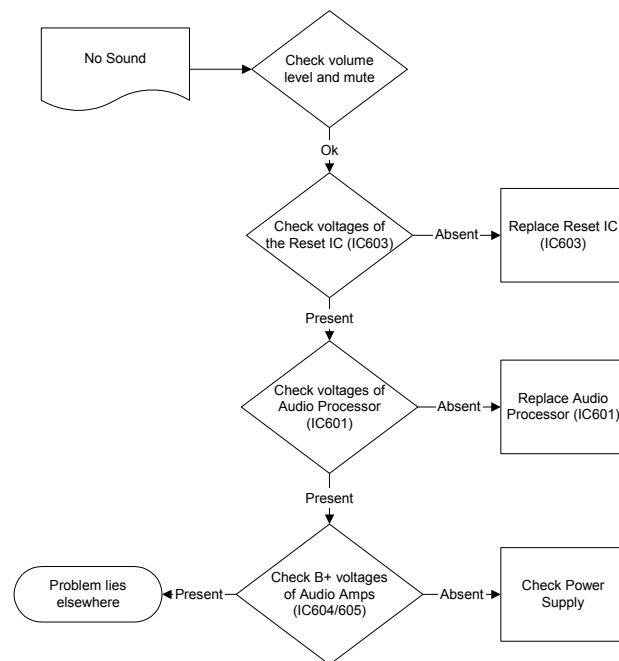
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PCB



TROUBLESHOOTING DIAGRAM

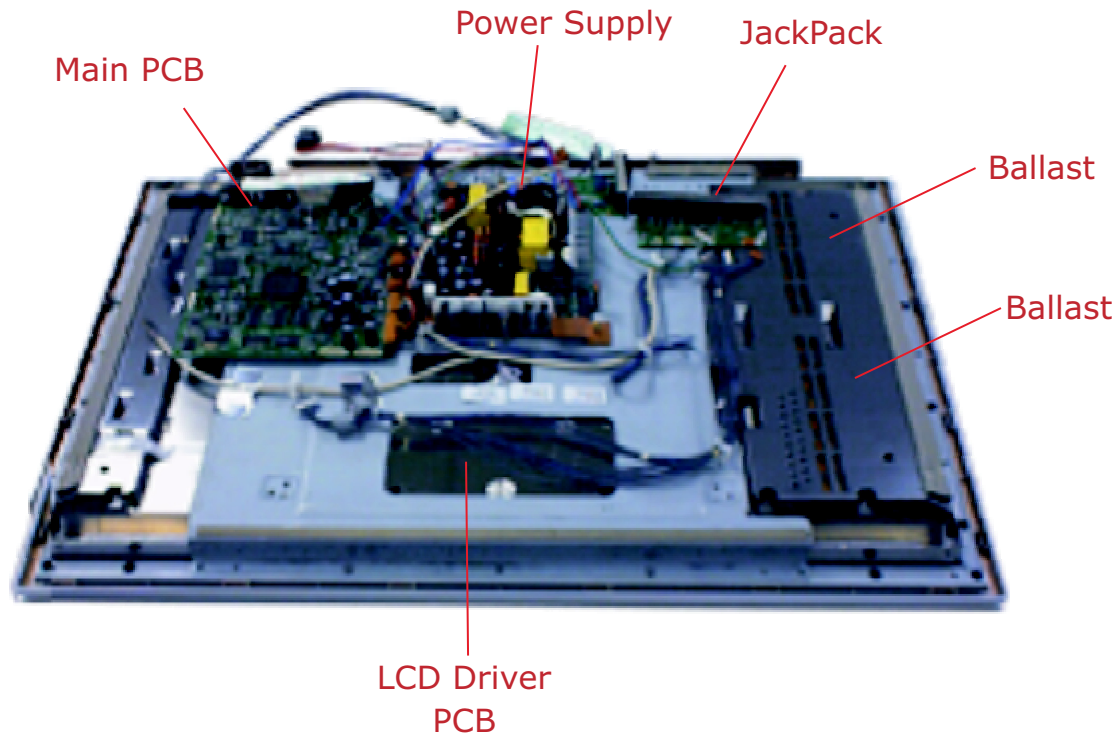


CIRCUIT DESCRIPTIONS

30" CIRCUIT DESCRIPTIONS (L30W26)

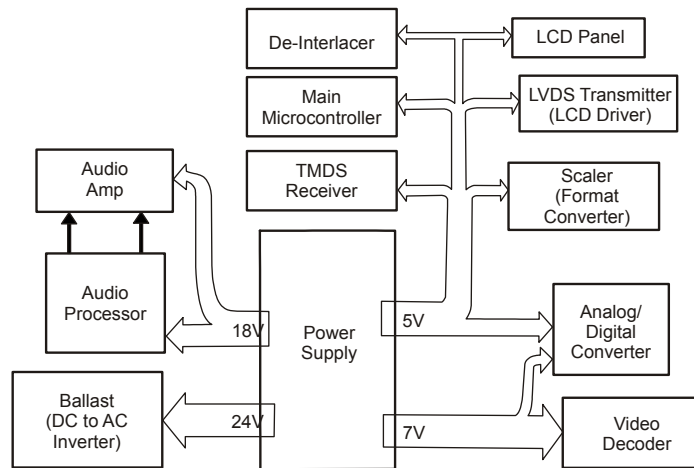
OVERVIEW

This set of descriptions is based on the 30" models L30W26, L30W36, MW-30LZ10, and MW-30LZ12. They are HD Monitors with no built-in tuners. HD inputs include component, DVI, and VGA (RGB).

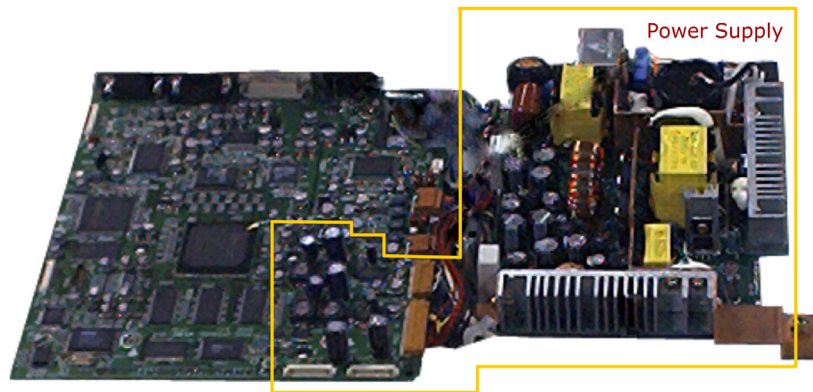


30" POWER SUPPLY

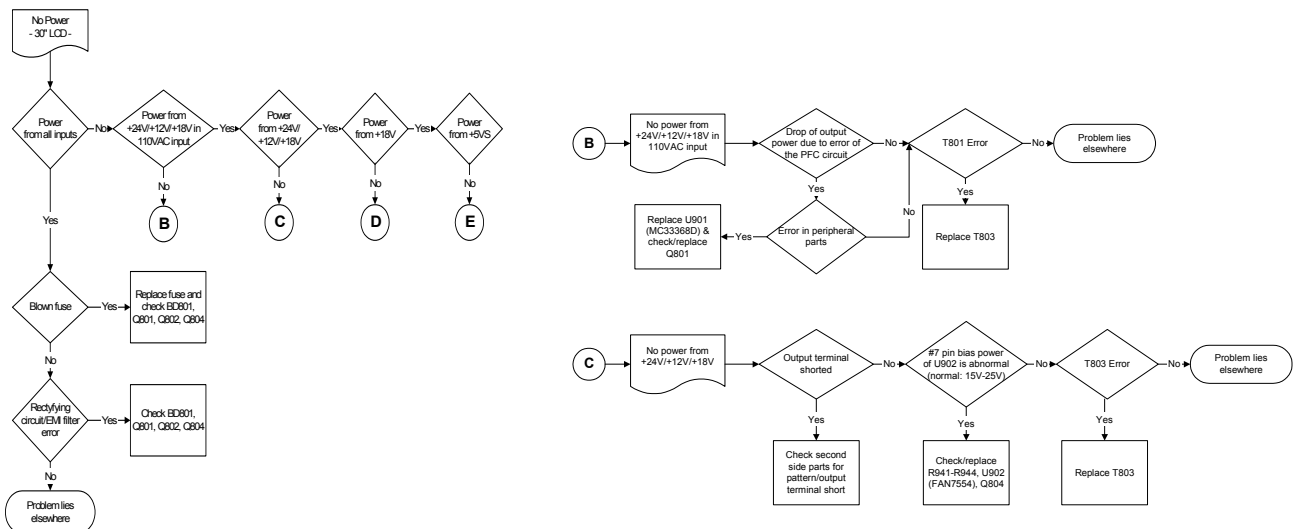
VOLTAGE DIAGRAM



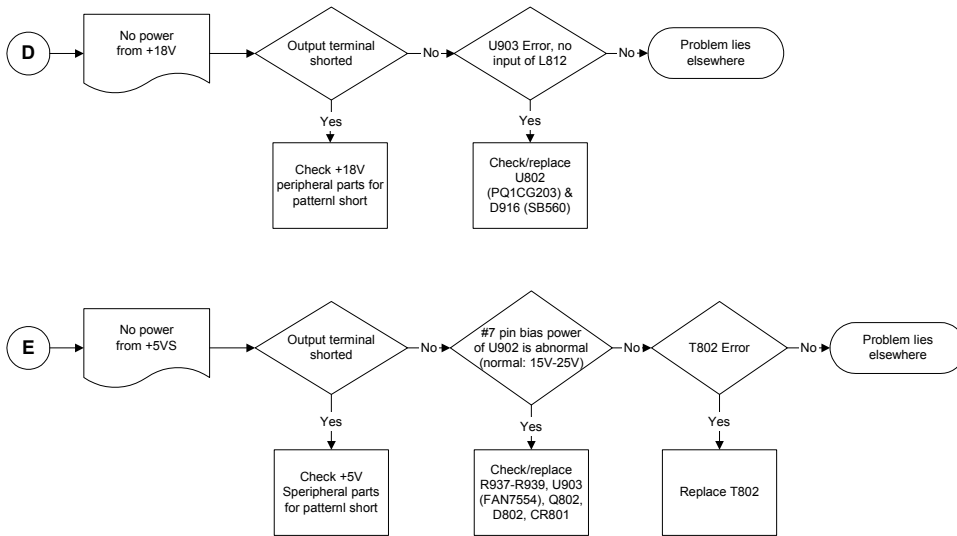
PCB



TROUBLESHOOTING DIAGRAM



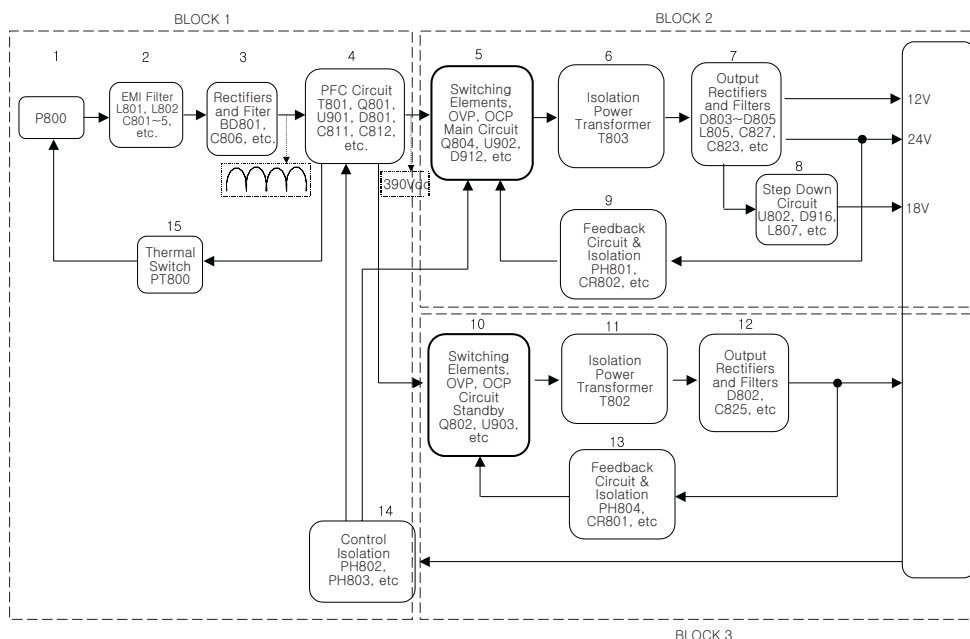
CIRCUIT DESCRIPTIONS



POWER SUPPLY DESCRIPTION

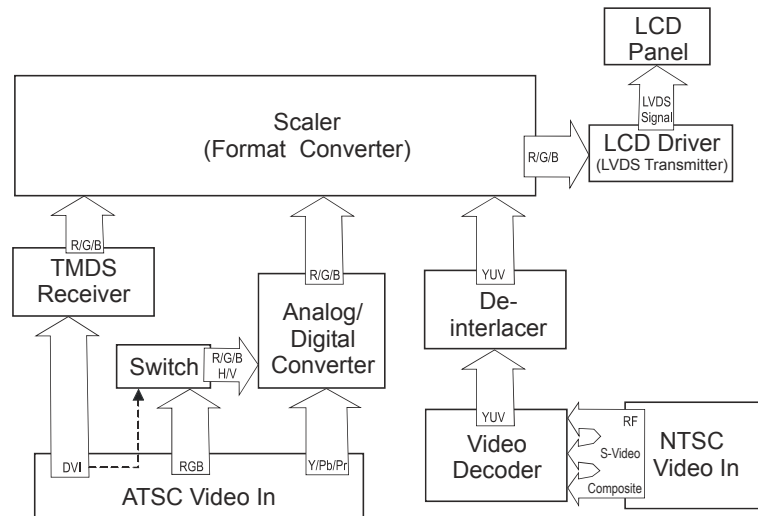
If the AC Input voltage (1) is confirmed, this voltage is adjusted as a DC wave form through the EMI filter (2) and the first rectifier/filter (3). This adjusted wave form is input to PFC circuit (4), Power Factor Correction). The output voltage (+390Vdc) of the PFC circuit becomes a main input voltage of the MAIN (5) and standby switching part (10). Using elements such as the FET and PWM IC, the switching parts (5, 10) convert this high DC voltage (390Vdc) to a spherical wave with a high frequency. To keep the secondary adjusted voltage regular and safe with changing input voltage and output load, the output voltage is monitored and fed back to the switching part through a control circuit (9).

BLOCK 2 works as a forward converter by receiving input from BLOCK 1 and supplying MAIN DC (+24V and +12V) voltage and the step down circuit (8) supplies +18V. BLOCK 3 works as a flyback converter by receiving the input of BLOCK 1 and supplying +5V for standby. A protection circuit is built into the switching part (5, 10) to protect over current, short, or over voltage of the secondary output. When overheating occurs, this circuit protects the output and switches the thermal switch (15) to radiator. The PFC circuit protects against fire or other accidents by turning the AC voltage off. If the OFF signal is transmitted to the PFC circuit (4). Only the +5V circuit for standby works and others are turned off to minimize power consumption.

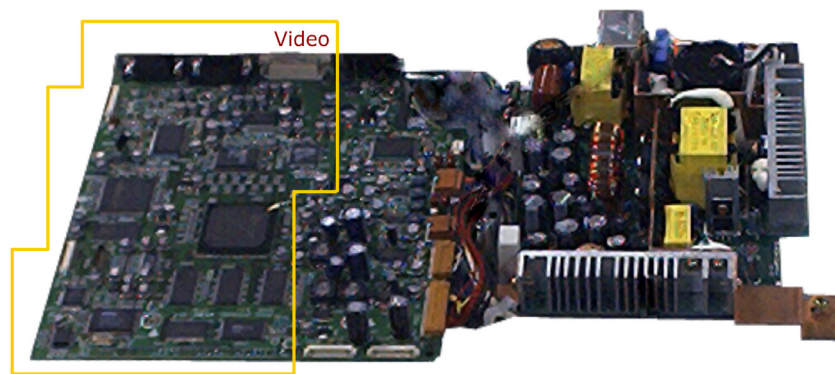


30" VIDEO

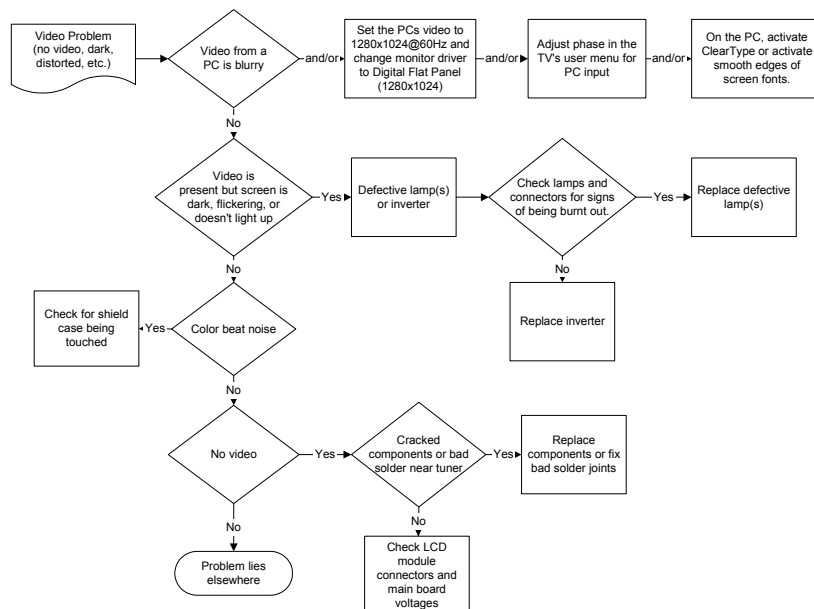
FLOWCHART



PCB



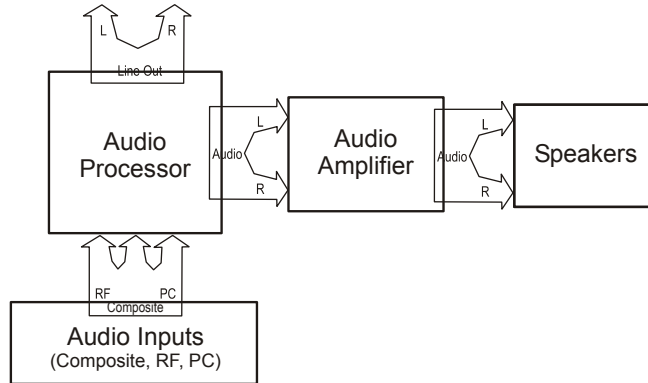
TROUBLESHOOTING DIAGRAM



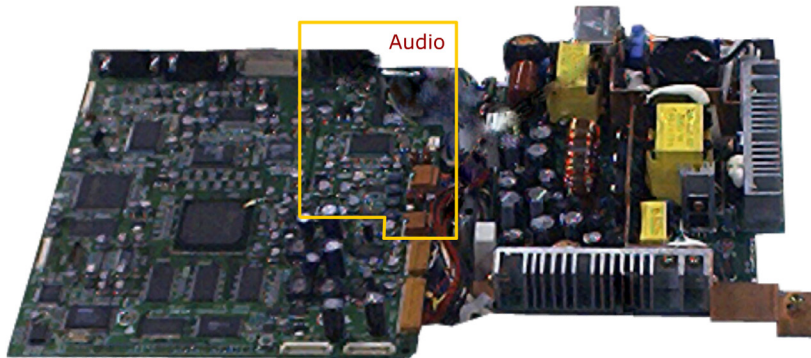
CIRCUIT DESCRIPTIONS

30" AUDIO

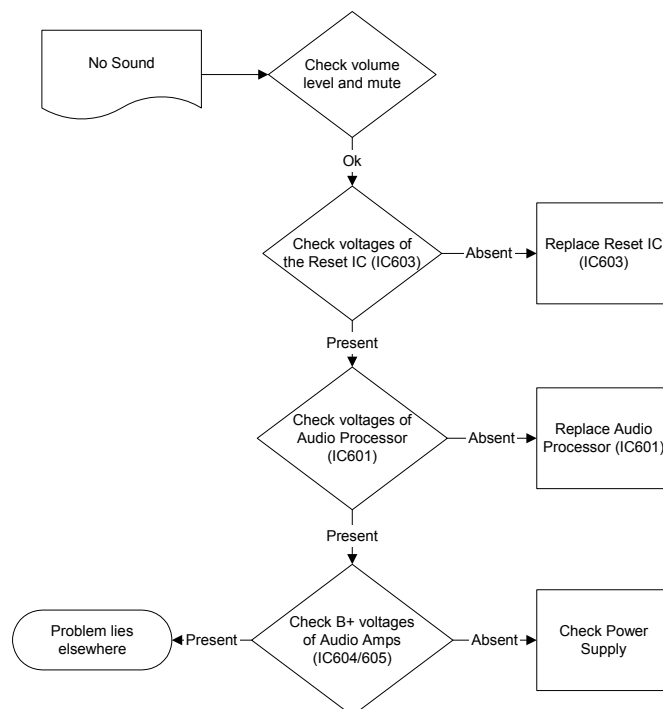
FLOWCHART



PCB



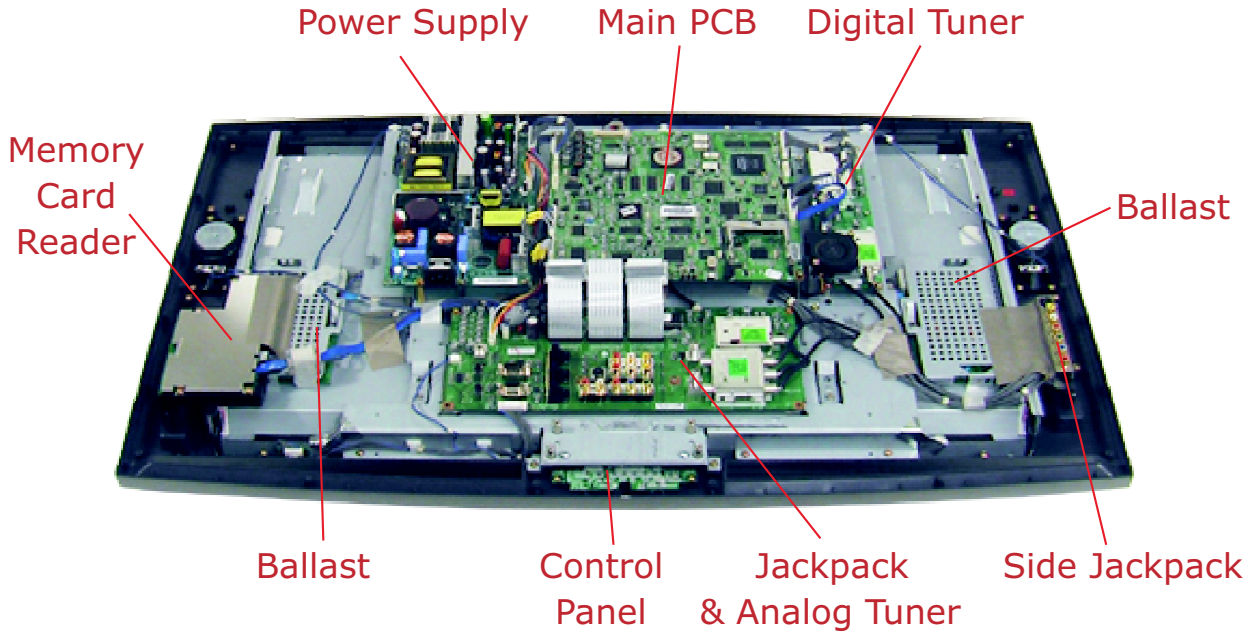
TROUBLESHOOTING DIAGRAM



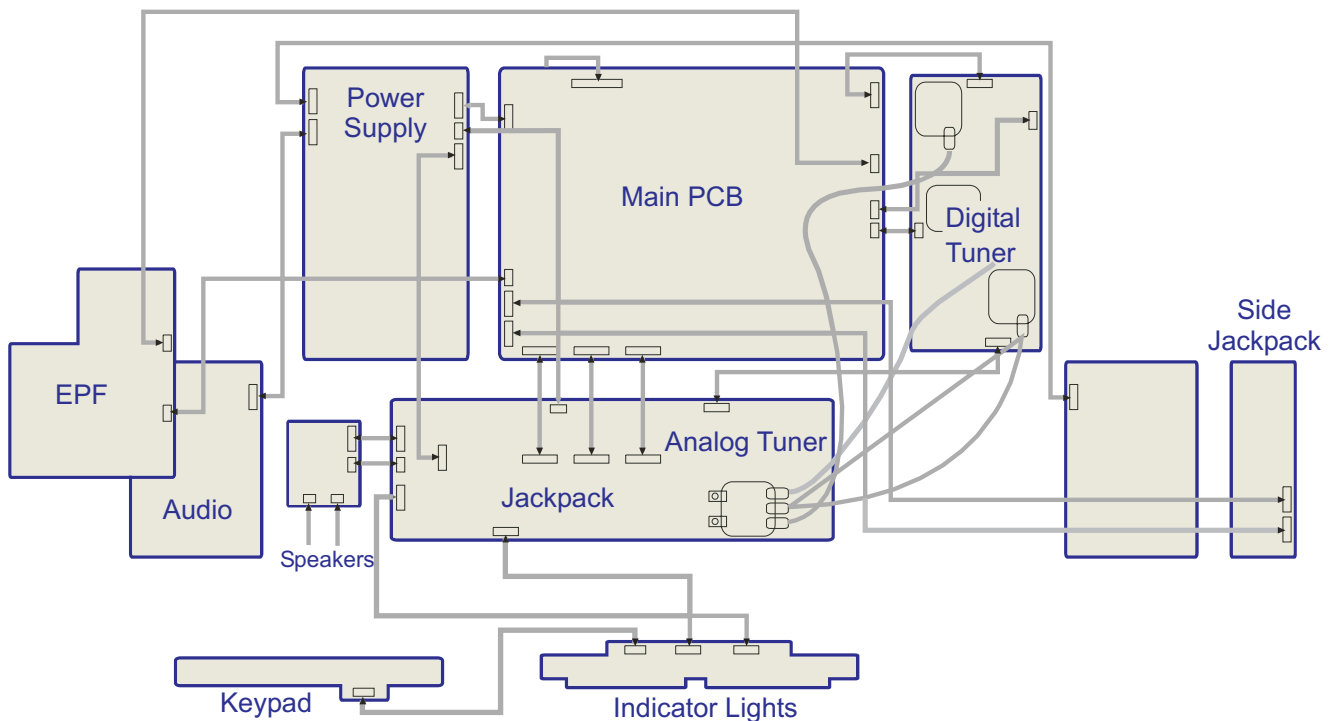
32" CIRCUIT DESCRIPTIONS (CABLECARD MODELS)

OVERVIEW

The following descriptions refer to models with CableCard: 32LX1D, 26LX1D, 26LX2D, 32LP1D, and 32LX2D.



WIRING DIAGRAM

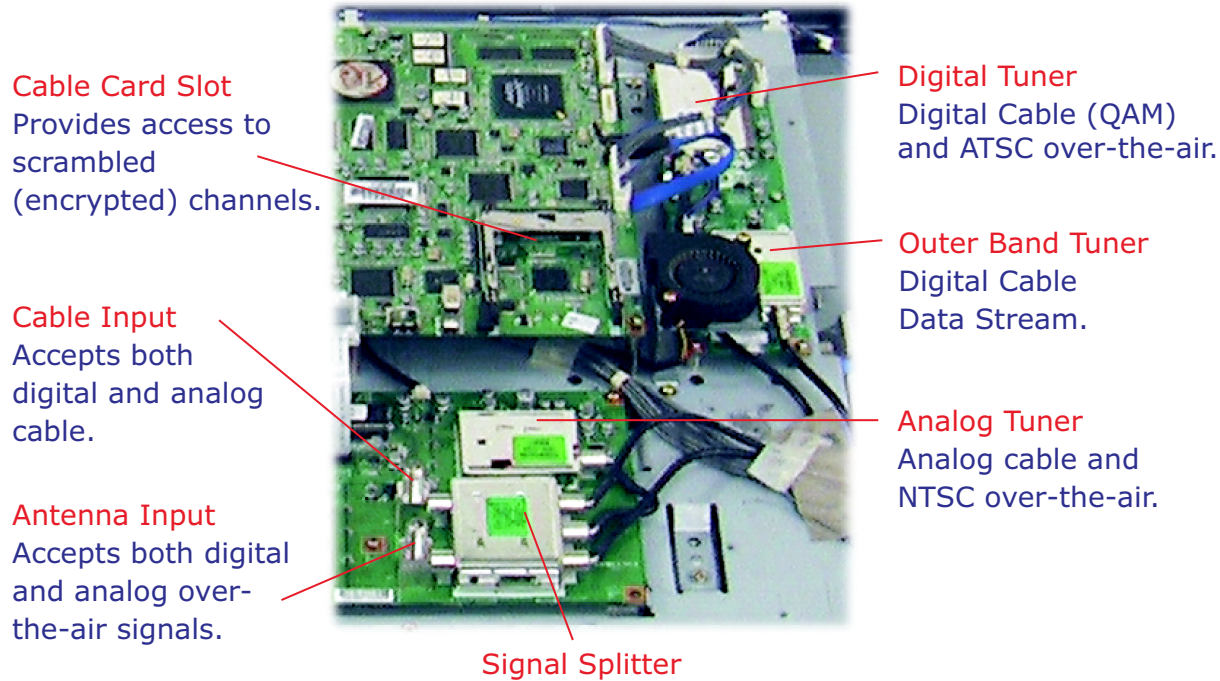


CIRCUIT DESCRIPTIONS

32" TUNING SYSTEM

OVERVIEW

The tuning system of CableCARD™ models have four essential parts: analog tuner, digital tuner, outer band tuner, and cable card slot.



Analog Tuner

The analog tuner is a standard NTSC tuner. It tunes analog signals from off-the-air (OTA) broadcasts and analog cable signals.

Digital Tuner

The ATSC tunes digital OTA signals (8-VSB) and digital cable signals (QAM). It supports both QAM64 and QAM256 digital cable standards.

Outer Band Tuner

This tuner translates data from digital signals. Mainly used for communications between a cable card and the cable company.

CableCARD™ Slot

A cable card on a Digital Cable Ready (DCR) television decrypts encoded signals from digital cable allowing cable companies to protect content on certain channels. Please refer to our cable card training for more information. For more information refer to the Cablecard section at the end of this manual.

TROUBLESHOOTING

No Analog TV (Cable or OTA)

Problem: Snow on all analog cable and OTA channels. Occasionally a memory card error appears on the screen.

Resolution: Check the analog tuner on the jackpack PCB. Check circuitry and connections, replace the PCB if necessary.

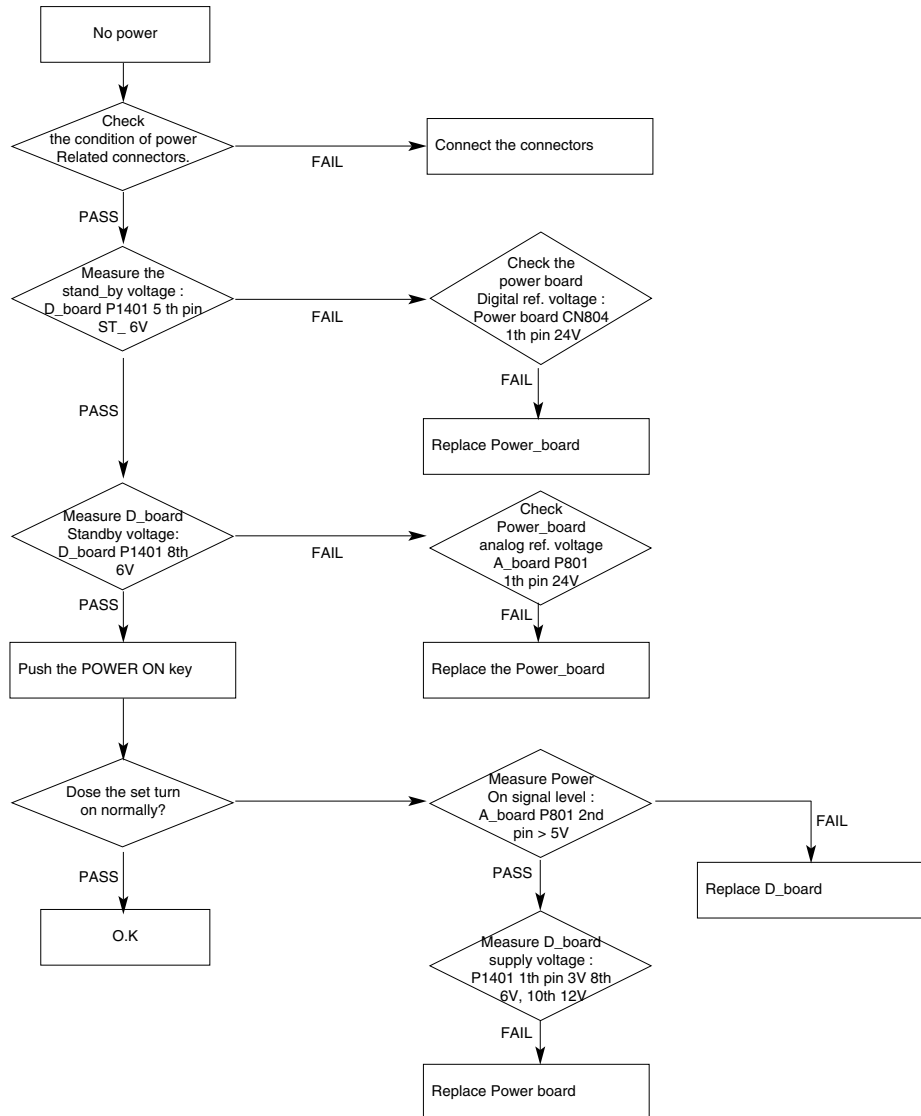
No Digital TV (Cable or OTA)

Problem: Snow on all digital cable and OTA channels.

Resolution: Check the digital tuner on the digital tuner PCB. Check circuitry and connections, replace the PCB if necessary.

32" POWERSUPPLY

TROUBLESHOOTING



General Troubleshooting

Problem: Doesn't go into standby mode (no red LED)

Resolution: Check power supply circuitry (and fuse).

Problem: LED blinks but stays red after pressing power.

Resolution: Check power supply or main PCB. Power supply is trying to turn on but doesn't receive any feedback from the TV, so it turns back off.

Problem: LED blinks green but then goes back to red.

Resolution: Check fan.

CIRCUIT DESCRIPTIONS

32" VIDEO

TROUBLESHOOTING

No video/Audio ok

Problem: Audio but no video.

Resolution: If the backlight is turning on, then most likely the problem is with the main PCB or LCD driver. If the backlights don't turn on, the ballast or lamps are most likely the problem.

Slow motion/Ghosting

Problem: Intermittent slow motion on analog.

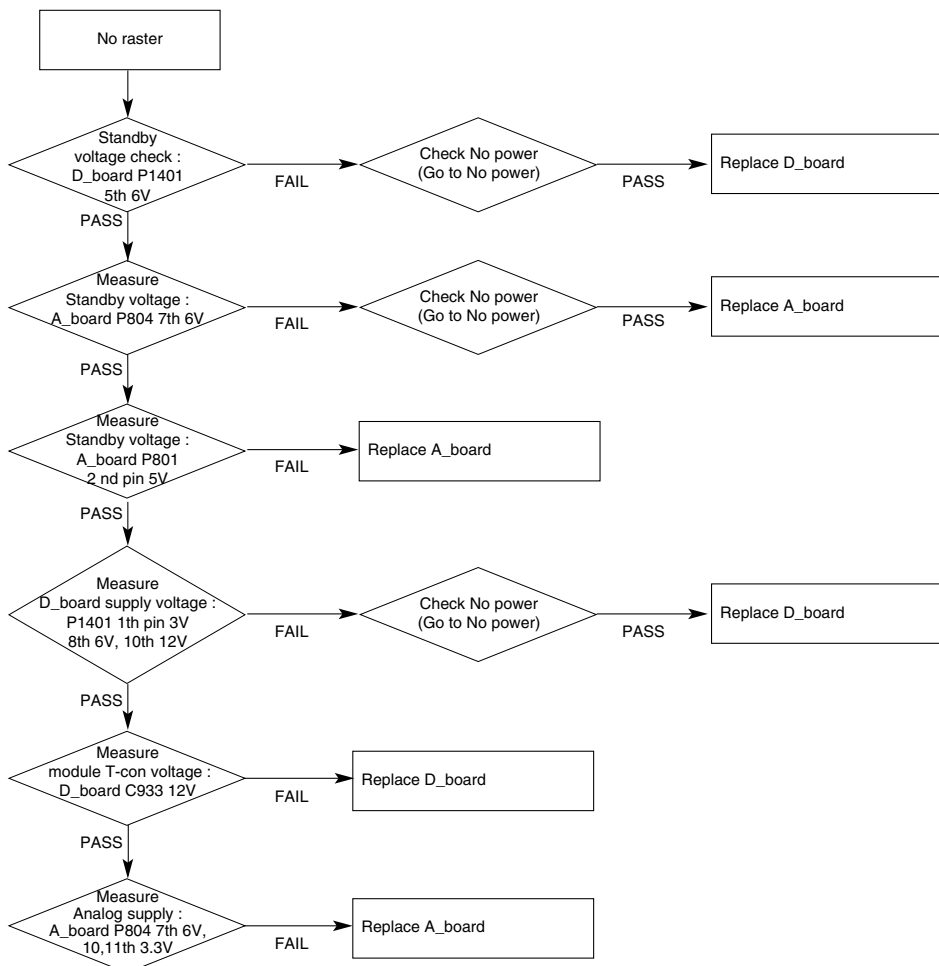
Resolution: Install firmware version 3.18 or newer or replace main PCB.

Green Tint on Component

Problem: Bad color or green tint on component inputs.

Resolution: Install firmware version 3.18 and then adjust color settings in the service menu. Write down original settings in case you need to return to those. Make sure you are in component input mode before entering the service menu. Some recommended color settings for component:

Red Gain 139	Red Offset 54
Green Gain 155	Green Offset 45
Blue Gain 139	Blue Offset 58



32" AUDIO

TROUBLESHOOTING

Low DTV audio

Problem: Digital TV audio is at a lower level than analog TV.

Resolution: Install firmware version 3.13 or newer.

Auto volume up

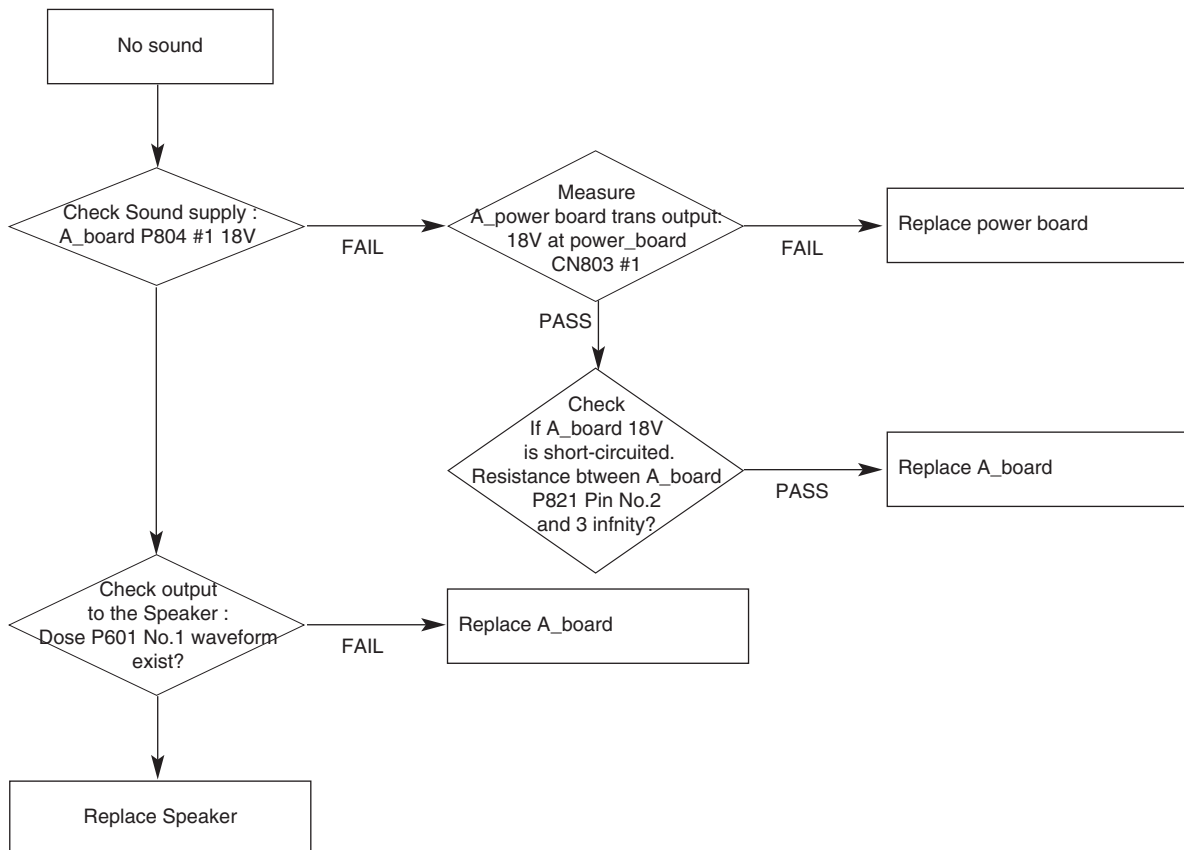
Problem: The volume suddenly goes up when the TV is turned on.

Resolution: Most likely changing the control panel PCB will fix the problem. Also check the connection on the main PCB.

Video but no sound

Problem: Partial or no sound. Resolution: First, check the menus to make sure the speakers are not turned off. Try different sources. If all sources have no sound, change the PCB that handles audio (normally the main PCB, jackpack PCB on new models with cable card support). Also check all connectors and cables.

Resolution: If only digital audio (from HDMI or Optical input) is missing, the input device doesn't support Dolby digital or the TV needs an updated main PCB. There are a few 2005 models that did not process digital audio properly and audio processing was updated during production. In this case, changing the Jackpack PCB will remedy the problem.

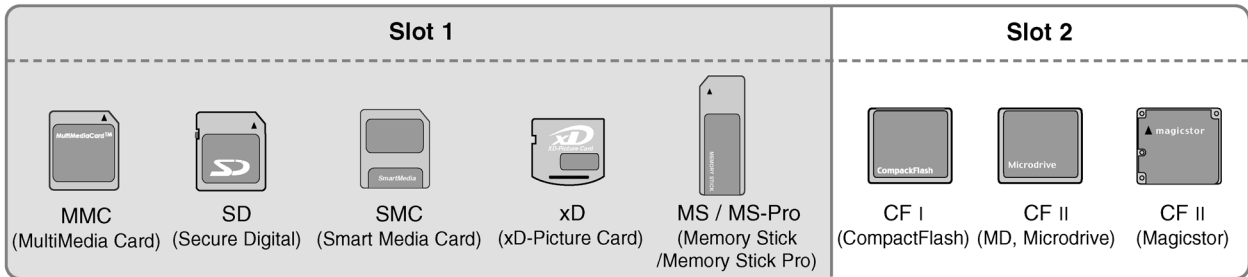


FIRMWARE UPDATES

FIRMWARE UPDATES VIA MEMORY CARD

Firmware can be updated using a memory card on newer LCD TVs that feature a memory card reader. When a memory card is inserted, the TV will look for any firmware updates located on the card. If it doesn't find an update newer than the version on the TV, it displays the normal media menu for displaying photos or playing music from the card.

Supported memory cards:



CHECK HARDWARE VERSION

Before updating the firmware, check the hardware version to be sure it will support the firmware you wish to install. To open the diagnostics screen, highlight the Cable icon in the user menu and then press the zero "0" button three times. The hardware version determines which firmware will work with that TV. If the hardware version is below 3.00, 3.13 is newest firmware that will work. For version 3.00, up to the 3.15 firmware will work. Version 3.01 does not currently need a firmware update since 3.16 is its original firmware.

FIRMWARE 3.18 SPECIAL REQUIREMENTS

For some models, firmware release 3.18 has different versions for different model revisions. Check the suffix of the TV and use the list below to determine which update to use. You will find the suffix on the back of the TV next to "Product Code". You can use either method to install the firmware, just make sure you use the correct file. A memory card received from LG will have the files for all three suffixes on it, use the Expert Method to choose the correct firmware to install.

slusllm - 3.18.3

spusllm - 3.18.4

spusltm - 3.18.5

FIRMWARE UPDATES

UPDATE INSTRUCTIONS - NORMAL METHOD

- 1) Copy the Firmware update to the memory card. This has already been done for you if the card came from LG Customer Service. The firmware file will have the file extension “.epk”. Only copy the firmware update for your model TV.
- 2) Turn the TV on and insert the memory card into the TV. If the firmware on the card is newer than the firmware in the TV, the following will be shown:

Current TV Software version: 3.08 (date: 5/5/2005)
The following new software is found in the memory card.
File: 42LP1DU_V313_rom.epk
- Main Software: 3.13

- 3) Press ENTER on the remote to begin the firmware update. The TV will restart automatically and show the progress of the update. **Do not remove the memory card or remove power from the TV until complete.**

Reading the file...Done
Main Software: Upgrading...22 Percent

- 4) The TV will show the following messages when the firmware update is complete:

Reading the file...Done
Main Software: Upgrading...Done

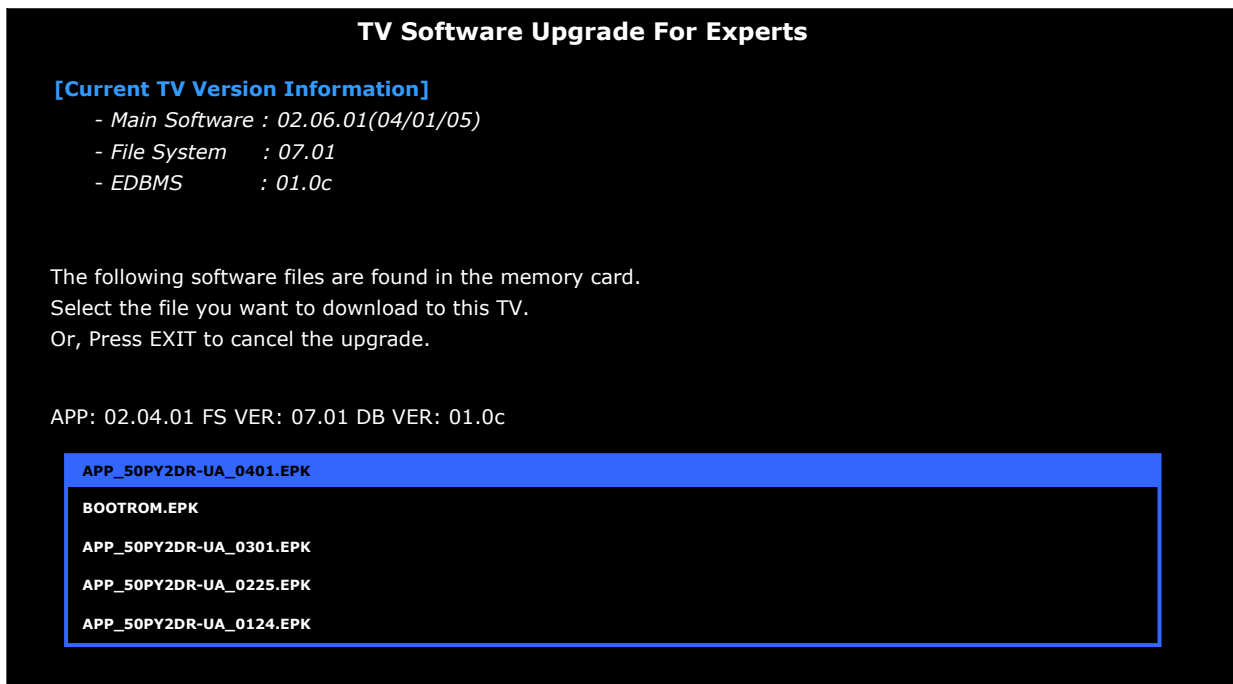
The software upgrade has been successfully completed.
Press ENTER to restart the TV now.
The TV will restart automatically in 14 seconds.

- 5) Press ENTER. After restarting, the TV is ready to use.

UPDATE INSTUCTIONS - EXPERT METHOD

Expert Mode will allow any firmware version on the card to loaded into the TV. This allows an older version of the firmware to be loaded when needed.

- 1) Copy the Firmware update to the memory card. The firmware file will have the file extension ".epk". Only copy the firmware update for your model TV.
- 2) Turn the TV on and insert the memory card into the TV.
- 3) If a menu displays on the screen, exit out of that screen. Press the MENU button and highlight (scroll down to) the Option menu. Press the MARK button 7 times and the expert mode screen will appear.



- 4) Use the arrow keys to select the firmware update to install. Press OK and follow the prompts.
- 5) When the update is complete, press ENTER to restart the TV. After restarting, the TV is ready to use.

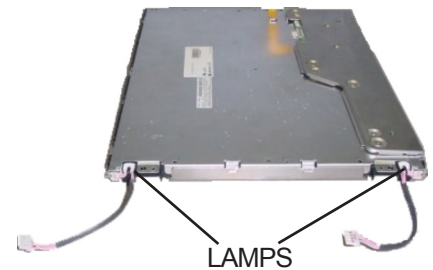
DISASSEMBLY

Models 23" and under have a similar internal layout and disassembly procedure. Therefore, the following disassembly instructions are divided into two parts. The first part covers the smaller screen LCDs (10"-23") and the other two parts cover large Sscreen LCDs (30" and up). The large screen disassembly instructions are broken into two parts since some large screen models have a different internal layout. Before disassembling, check the troubleshooting information to theorize what the problem could be and determine the level of disassembly that will be needed.

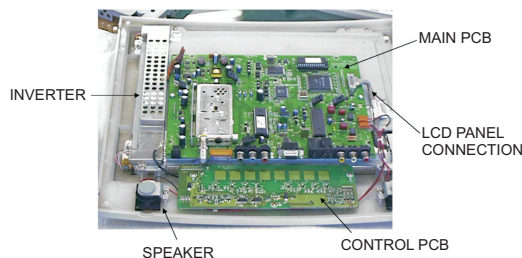
SMALL SCREEN MODELS

Small screen LCDs have two lamp assemblies, one on top and one on bottom of the screen. To gain access to the lamps, the front and rear cover must be removed. To gain access to the ballast assembly (inverter), only the back cover needs to be removed.

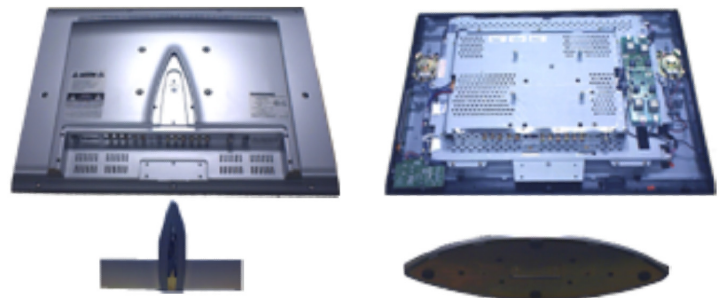
- 1) First, remove the the stand and back cover.
- 2) Now there is access to the ballast.
- 3) Remove the display assembly from the front cover in order to gain access to the lamps. First, you will need to remove the PCB shields, unplug the the power switch, and remove both speakers.
- 4) To slide the lamps out remove the small screw, unplug the cables from the ballast, and then remove the cables from the black hook located at their base. Now the lamp can slide out.



15" LAYOUT

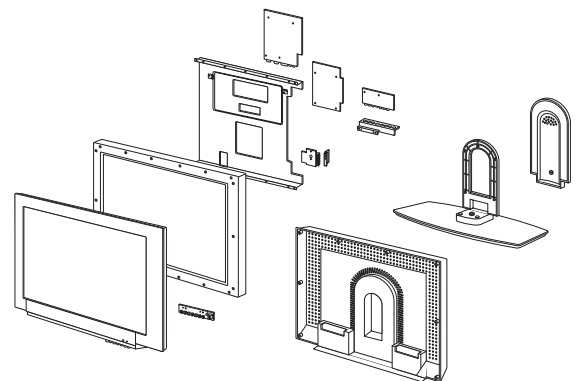


20" LAYOUT



LARGE SCREEN MODELS - PART 1

This set of instructions is based on the 30" models L30W26, L30W36, MW-30LZ10, and MW-30LZ12.



DISASSEMBLY

Note: This model contains many screws. During each level of disassembly, keep the screws separated to ease reassembly. If desired, mark the screws and screw hole with different colored markers while disassembling.

- 1) Remove the cover and the stand.
- 2) Remove the back cover.

With the back cover removed, individual circuit boards can be removed. The ballast assemblies can be accessed by removing the shield covering them. To gain access to the lamps, continue with the disassembly, starting with the support assembly. To remove the support assembly, first remove circuit boards that block the assembly's screws.

To aid with reassembly, mark each screw and location with a marker to insure they are used in the correct location. Use a different color marker for each level of disassembly.

- 3) Remove the Speaker and Control panel circuit boards.
- 4) Remove the Backpack circuit board.
- 5) Remove the screws from the NTSC board and lay it over on the Power Supply board (there is no need to disconnect the board). Now, remove the frame and front of the cabinet.

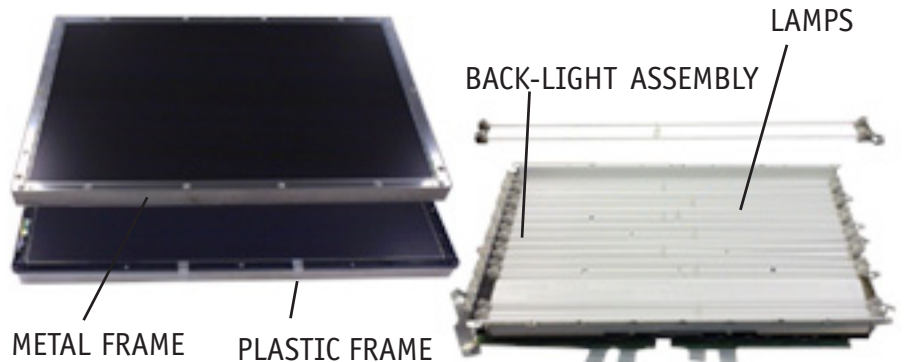
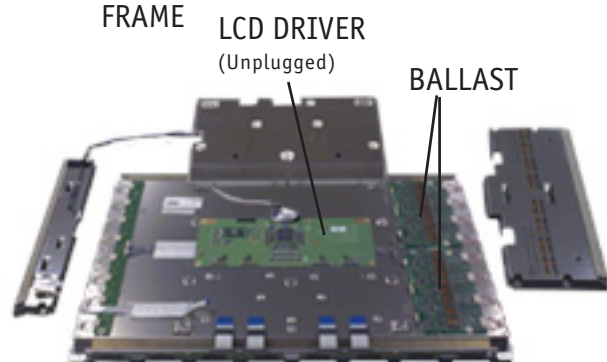
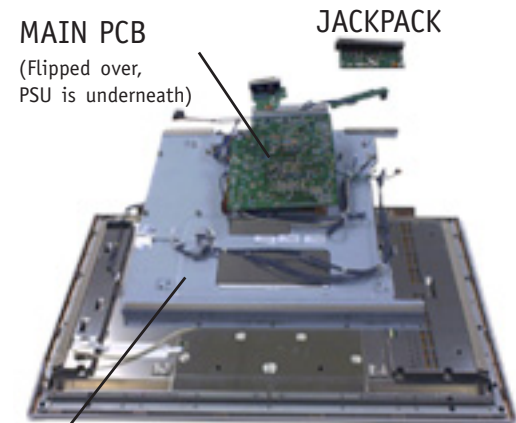
- 6) Remove the shields from the three remaining circuit boards.

- 7) Now remove the LCD driver board by removing the cables. There is a latch on each of the female connectors that must be lifted before the cable can be removed.

- 8) To gain access to the lamps, turn the panel over, remove the screen's metal frame, and remove the screws holding the plastic frame in place.

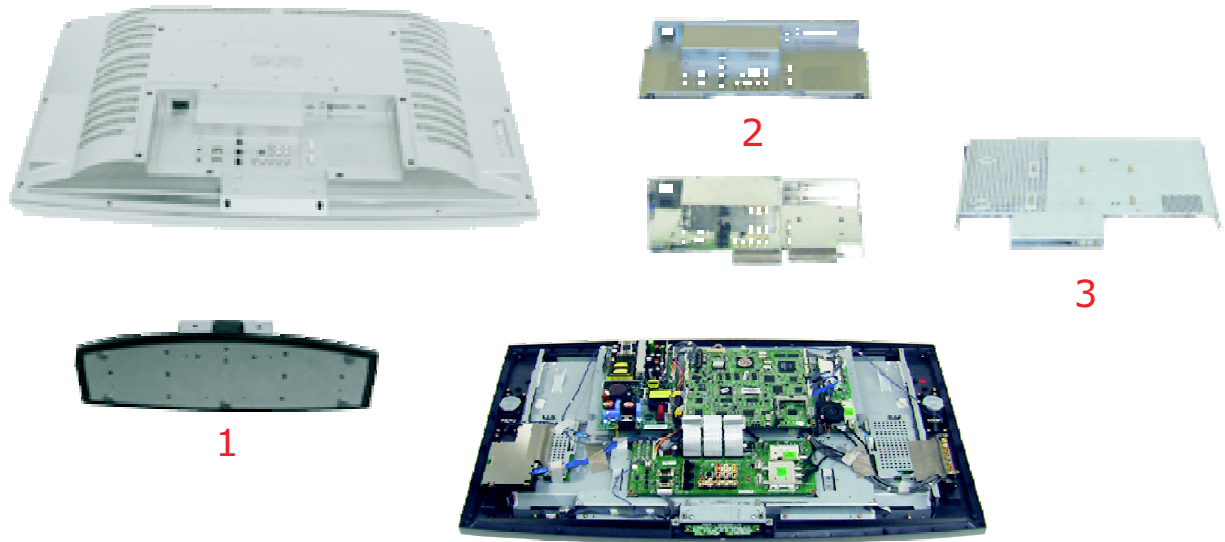
- 9) Once the screws are removed, place the metal frame back onto the screen (do not replace the screws). Turn the assembly over and remove the LCD driver cables from their holders. Then *carefully* lift the back-light assembly up from the screen.

- 10) Replace any defective lamps by unplugging the connectors at both ends, release the bulbs from the plastic holders (in the middle of each lamp assembly), and lift them up.

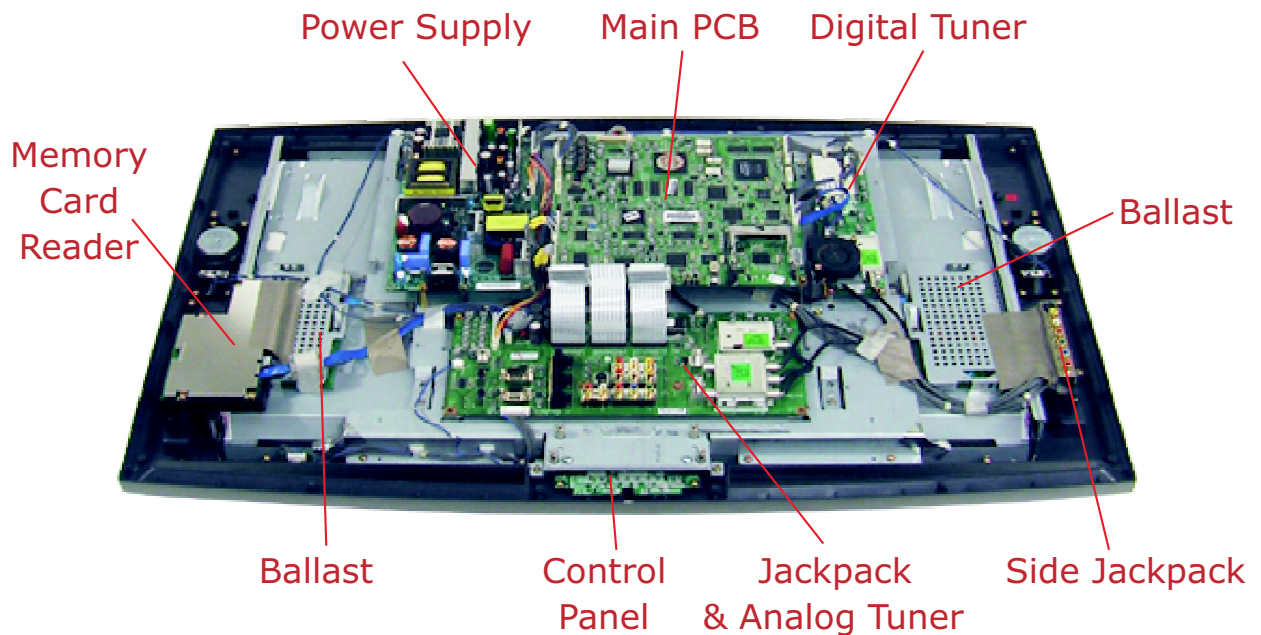


LARGE SCREEN MODELS - PART 2

This example covers the models with CableCard. The example was made using the 32LX1D. It is very similar to the 26LX1D, 26LX2D, 32LP1D, and 32LX2D.



- 1) Remove the stand and back cover.
 - 2) Remove the Backpack trim piece and shield.
 - 3) Remove the main shield.
- Now most parts can be accessed.



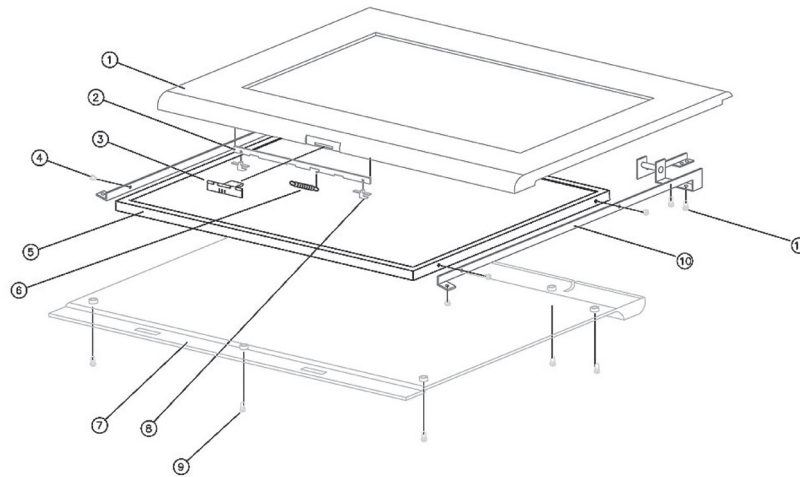
DISASSEMBLY

EXPLODED VIEWS

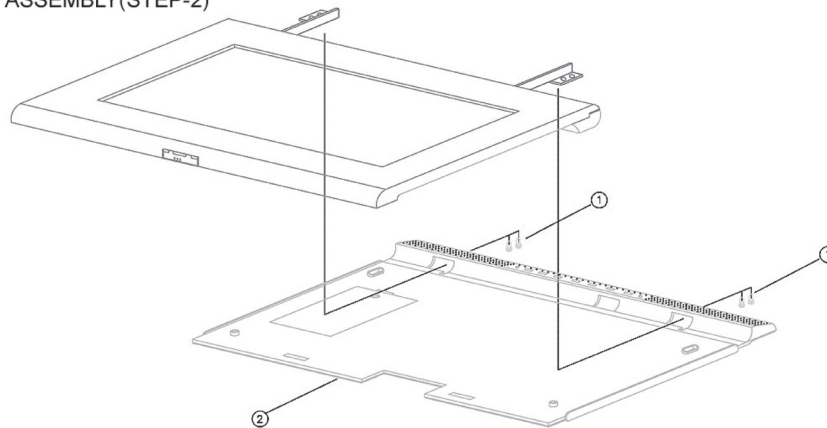
This section contains exploded views to aid in disassembly and assembly.

L10V22 EXPLODED VIEWS

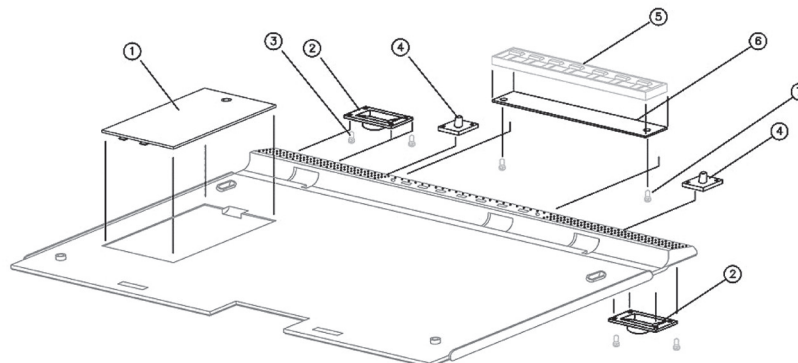
ASSEMBLY(STEP-1)



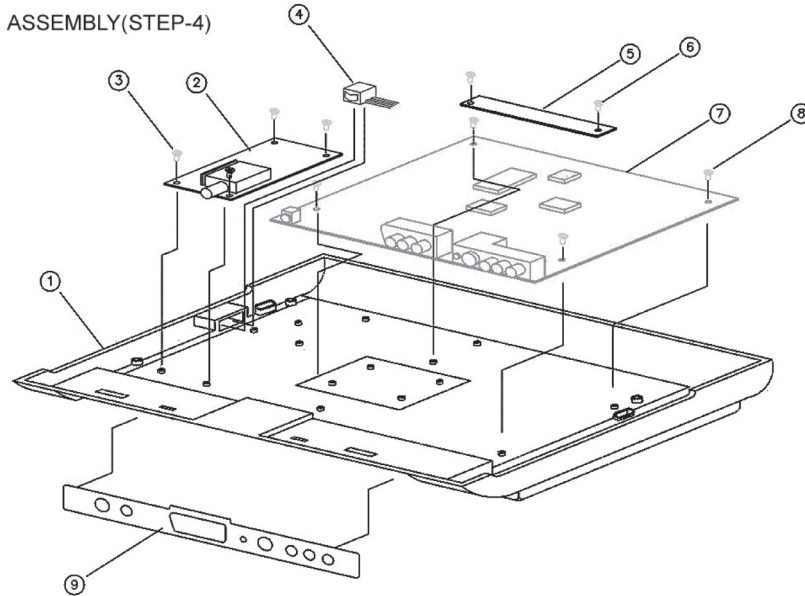
ASSEMBLY(STEP-2)



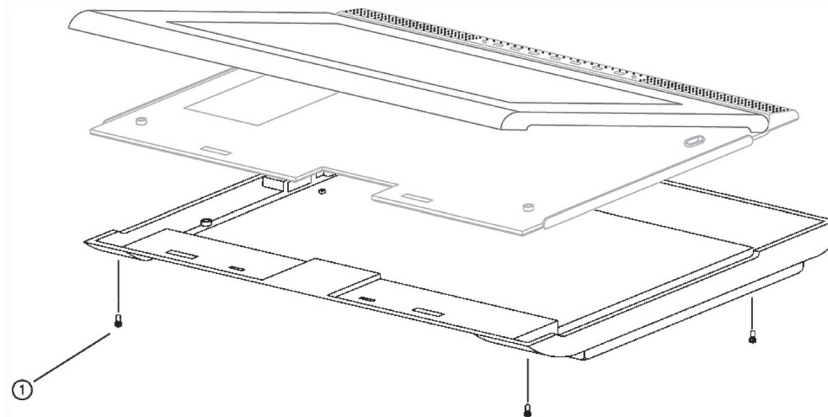
ASSEMBLY(STEP-3)



ASSEMBLY(STEP-4)



ASSEMBLY(STEP-5)



ASSEMBLY (STEP-1)

NO.	PART NO.	DESCRIPTION
1	400-001A	FRONT COVER
2	405-001A	LOCK BAR
3	405-001B	LOCK BAR SWITCH
4	410-001E	SCREW PP2*0,4*3
5	PANLP104S500	10.4" TFT LCD, LP104S5(B2AP)
6	406-001A	LOCK SPRING
7	401-001A	PANEL COVER
8	405-001C	LOCK STOPPER
9	410-001A	SCREW PTTB 2.5*7
10	403-00A	HINGE ASSY
11	410-001D	SCREW PP 3*6

ASSEMBLY (STEP-2)

NO.	PART NO.	DESCRIPTION
1	410-001D	SCREW PP 3*6
2	402-002A	BASE COVER

ASSEMBLY (STEP-3)

NO.	PART NO.	DESCRIPTION
1	402-001A	TUNER COVER
2	610-001A	SPEAKER
3	410-001A	SCREW PTTB 2.5*7
4	408-002A	SENSOR LENS
5	404-001A	CONTROL KNOB
6	AYCOLT10A01A	CONTROL BOARD
7	410-001A	SCREW PTTB 2.5*7

ASSEMBLY (STEP-4)

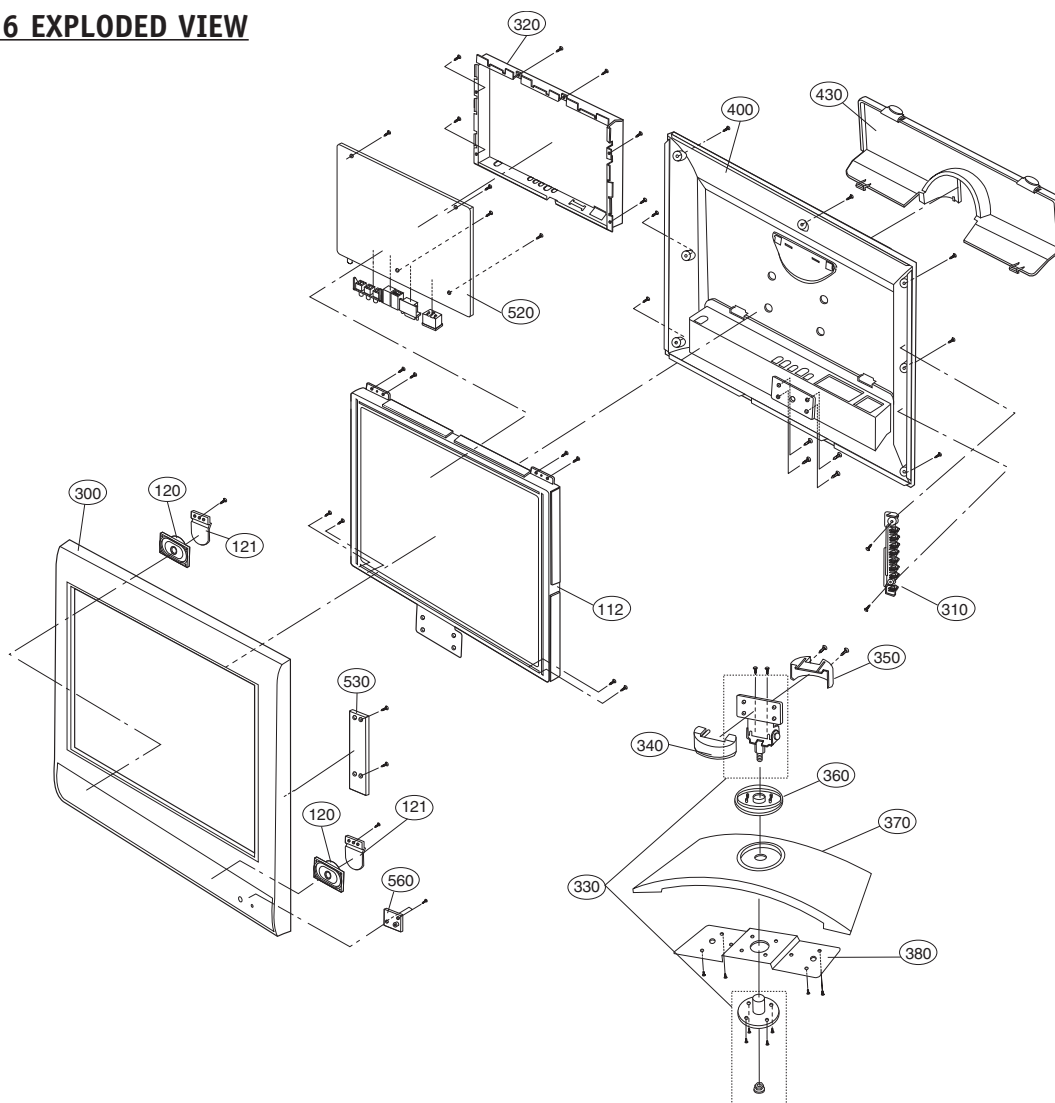
NO.	PART NO.	DESCRIPTION
1	401-002A	BASE BACK
2	AYIFLT11A01A	TUNER BOARD
3	410-001A	SCREW PTTB 2.5*7
4	600-001A	POWER SWITCH
5	622-001A	INVERTER ASSY
6	410-001A	SCREW PTTB 2.5*7
7	AYMALT11A01A	MAIN BOARD
8	410-001A	SCREW PTTB 2.5*7
9	450-001A	DECO PLATE

ASSEMBLY (STEP-5)

NO.	PART NO.	DESCRIPTION
1	410-001D	SCREW PTTB 3*6

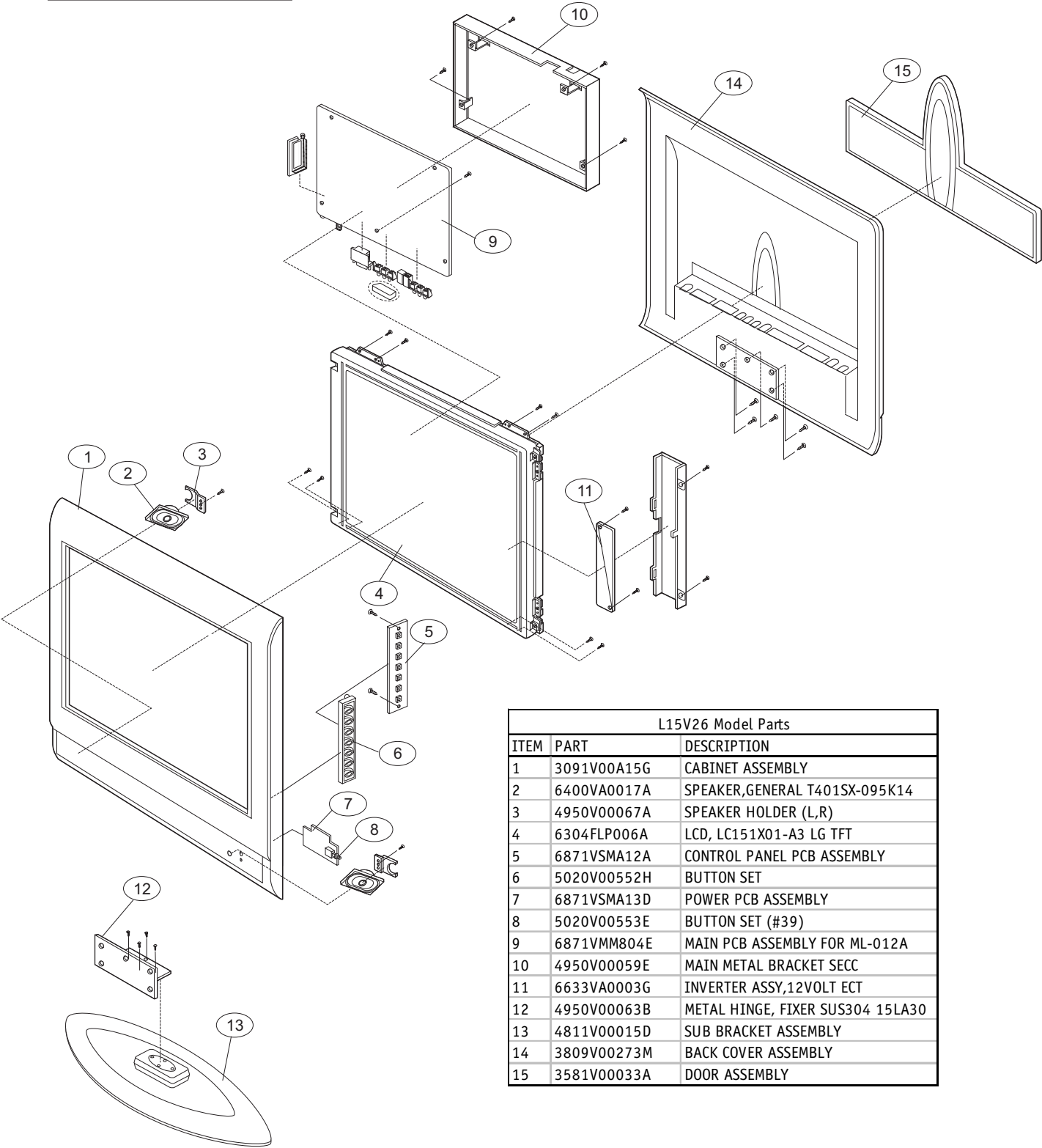
DISASSEMBLY

L13V36 EXPLODED VIEW



L13V36 Model Parts		
ITEM	PART	DESCRIPTION
120	6400VA0017A	SPEAKER,GENERAL T401SX-095K14 8 OHM 1.0/1.5W 81DB
121	4950V00170A	METAL,HOLDER SECC(EGI)
300	3091V00493B	CABINET ASSEMBLY,RU-13LA60 STEREO ML024C ZENITH
310	5020V00778B	BUTTON,CONTROL RU-13LA60 ABS, HF-380 8KEY
320	4950V00144B	METAL,FRAME SECC(EGI) RJ-13LA60,PRESS DIE
330	4950V00157B	METAL,HINGE ASSY NON RJ-13LA60
340	3550V00300C	COVER,FRONT RJ-13LA60 ABS
350	3550V00301C	COVER,REAR RJ-13LA60 ABS HINGE
360	4810V00785B	BRACKET,DECO RU-13LA60 NON ABS, HF-380
370	4810V00784C	BRACKET,STAND RJ-13LA60 ML024C ABS
380	4950V00161A	METAL,BASE EGI STAND
400	3809V00341B	BACK COVER ASSEMBLY,RU-13LA60 NON ZENITH
430	3550V00302C	COVER,REAR AV RJ-13LA60 ABS .
520	6871VMMQ08A	PCB ASSEMBLY,MAIN ML-024C RU-13LA60
530	6871VSMV23A	PCB ASSEMBLY,SUB CONT ML024C CONTROL 13
560	6871VSMV22A	PCB ASSEMBLY,SUB POWER ML024C POWER 13

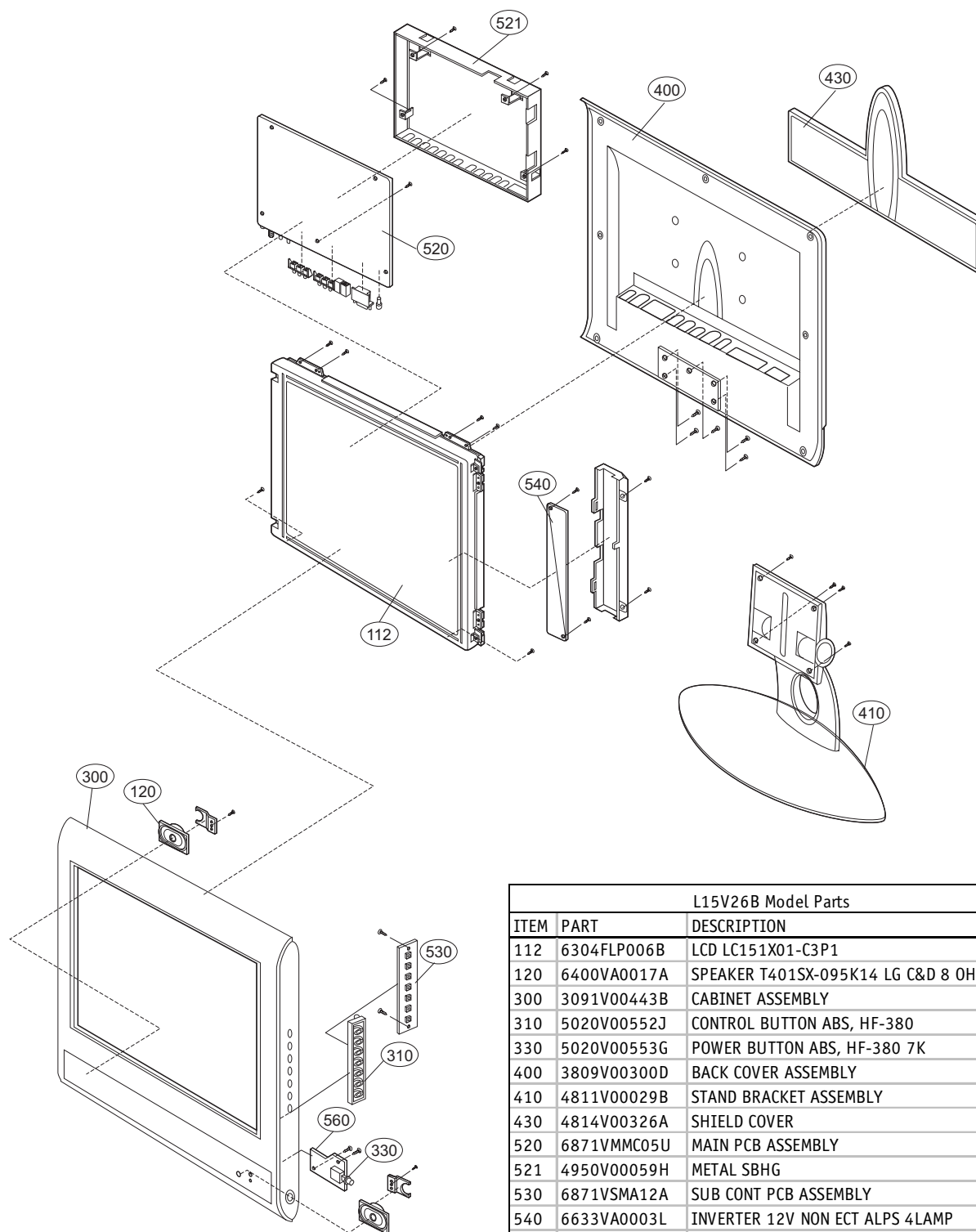
L15V26 EXPLODED VIEW



L15V26 Model Parts		
ITEM	PART	DESCRIPTION
1	3091V00A15G	CABINET ASSEMBLY
2	6400VA0017A	SPEAKER,GENERAL T401SX-095K14
3	4950V00067A	SPEAKER HOLDER (L,R)
4	6304FLP006A	LCD, LC151X01-A3 LG TFT
5	6871VSMA12A	CONTROL PANEL PCB ASSEMBLY
6	5020V00552H	BUTTON SET
7	6871VSMA13D	POWER PCB ASSEMBLY
8	5020V00553E	BUTTON SET (#39)
9	6871VMM804E	MAIN PCB ASSEMBLY FOR ML-012A
10	4950V00059E	MAIN METAL BRACKET SECC
11	6633VA0003G	INVERTER ASSY,12VOLT ECT
12	4950V00063B	METAL HINGE, FIXER SUS304 15LA30
13	4811V00015D	SUB BRACKET ASSEMBLY
14	3809V00273M	BACK COVER ASSEMBLY
15	3581V00033A	DOOR ASSEMBLY

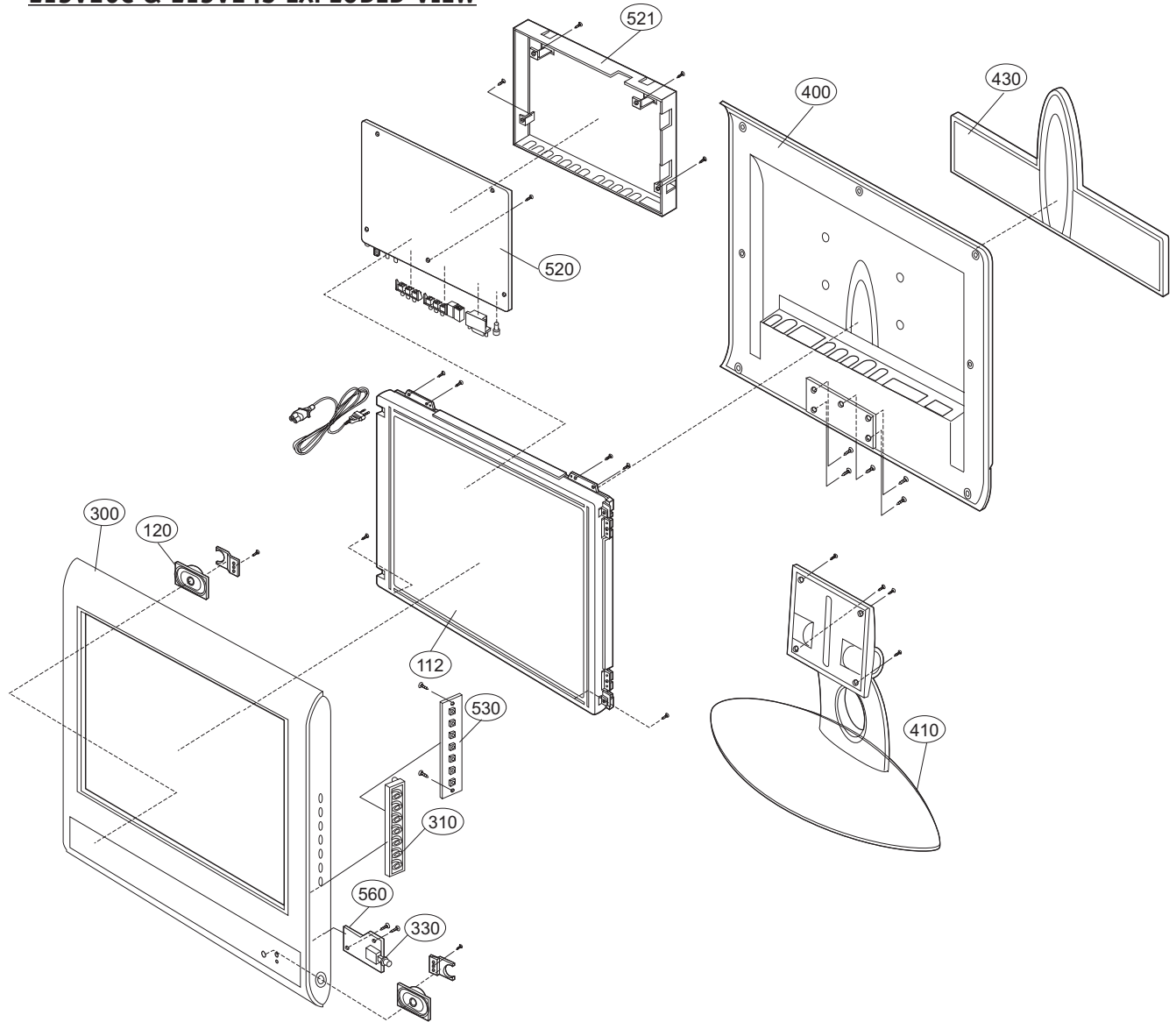
DISASSEMBLY

L15V26B EXPLODED VIEW



L15V26B Model Parts		
ITEM	PART	DESCRIPTION
112	6304FLP006B	LCD LC151X01-C3P1
120	6400VA0017A	SPEAKER T401SX-095K14 LG C&D 8 OHM 1.0
300	3091V00443B	CABINET ASSEMBLY
310	5020V00552J	CONTROL BUTTON ABS, HF-380
330	5020V00553G	POWER BUTTON ABS, HF-380 7K
400	3809V00300D	BACK COVER ASSEMBLY
410	4811V00029B	STAND BRACKET ASSEMBLY
430	4814V00326A	SHIELD COVER
520	6871VMMC05U	MAIN PCB ASSEMBLY
521	4950V00059H	METAL SBHG
530	6871VSMA12A	SUB CONT PCB ASSEMBLY
540	6633VA0003L	INVERTER 12V NON ECT ALPS 4LAMP
560	6871VSMA13G	SUB POWER PCB ASSEMBLY

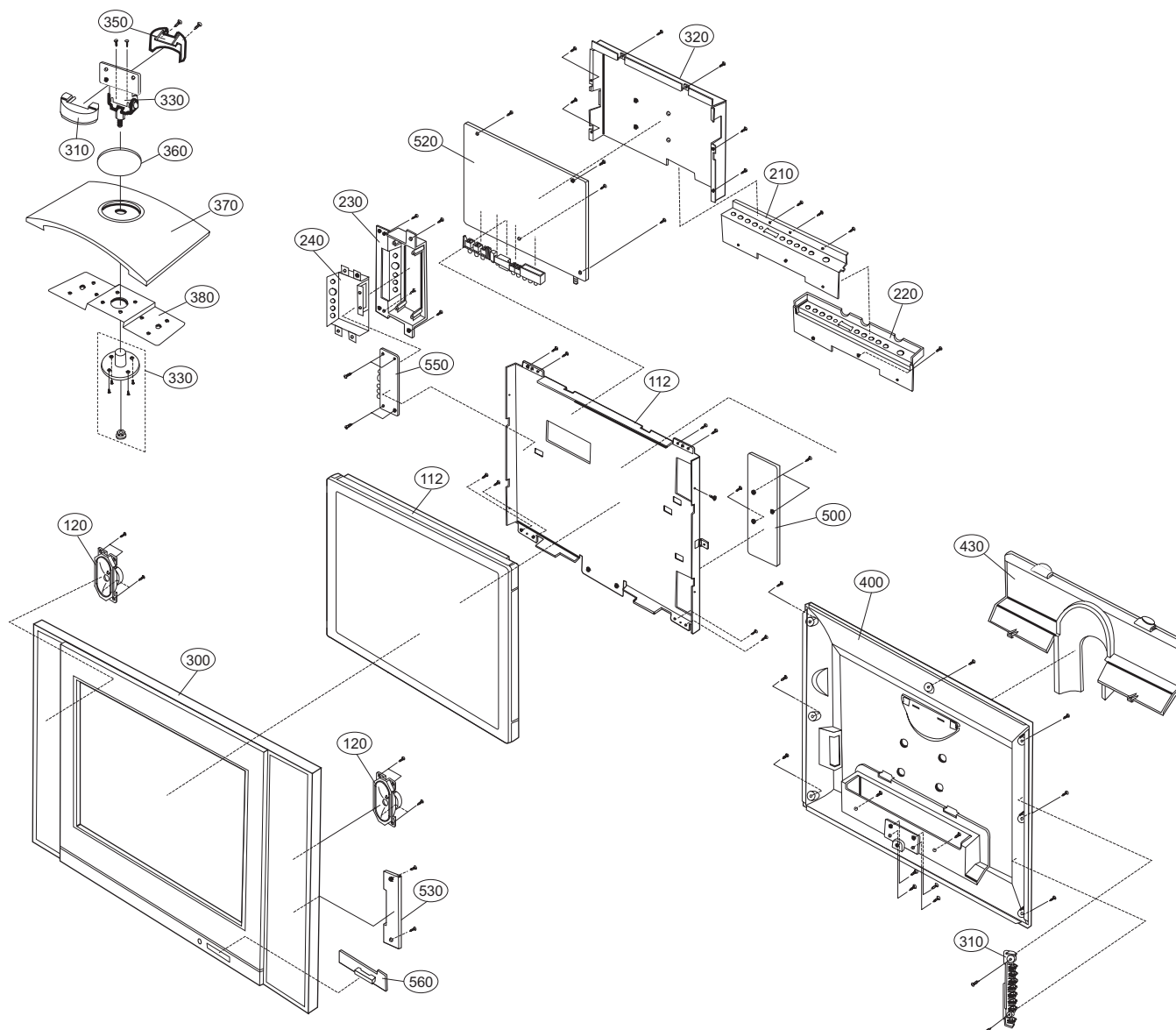
L15V26C & L15V24S EXPLODED VIEW



L15V26C & L15V24S Model Parts			
ITEM	L15V24S	L15V26C	DESCRIPTION
112	6304FLP006C	6304FLP006C	LCD MODULE LC151X01-C3M2
120	6400VA0017A	6400VA0017A	SPEAKER T401SX-095K14 80HM 1.0/1.5W
300	3091V00443A	3091V00443B	CABINET ASSEMBLY
310	5020V00552K	5020V00552J	7KEY CONTROL PANEL
330	5020V00553H	5020V00553G	POWER BUTTON
400	3809V00300A	3809V00300B	BACK COVER ASSEMBLY
410	4811V00029A	4811V00029C	MAIN BRACKET ASSEMBLY
430	4814V00297A	4814V00269A	A/V PLATE SHIELD
520	6871VMMB86A	6871VMMN53A	MAIN PCB ASSEMBLY
521	4950V00101A	4950V00101A	MAIN FRAME METAL
530	6871VSMA12A	6871VSMA12A	SUB CONT PCB ASSEMBLY
560	6871VSMN38A	6871VSMN38B	SUB PSW PCB ASSEMBLY POWER

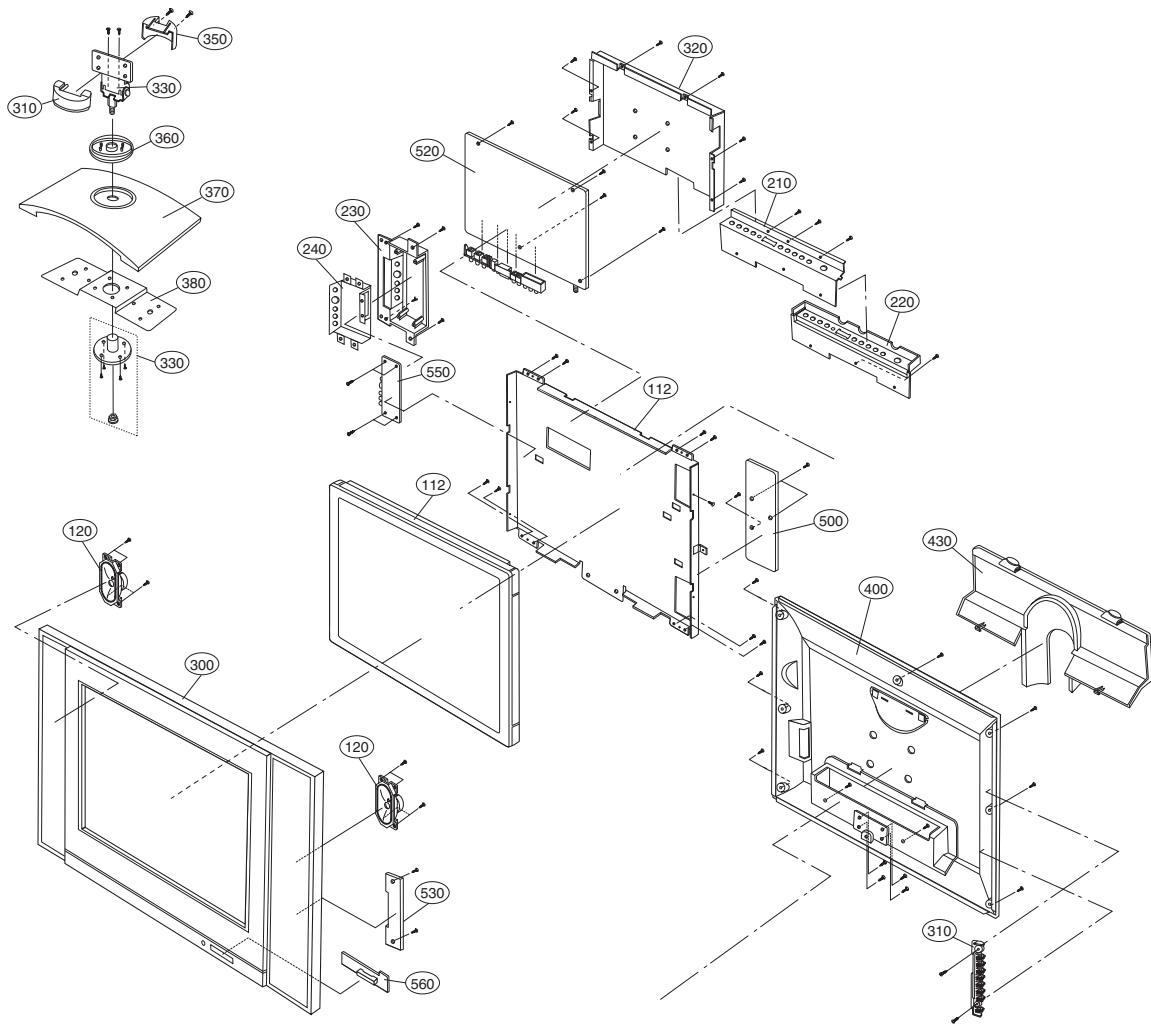
DISASSEMBLY

L15V36 EXPLODED VIEW



L15V36 Model Parts					
ITEM	PART	DESCRIPTION	ITEM	PART	DESCRIPTION
112	6306V15001A	LCD MODULE, LC150X01-A3 IPS LG PHILIPS	350	4810V00778B	BRACKET, STAND NON ABS, HF-380
120	6400GKTX01A	SPEAKER, F1527C-6428 80HM 7/12W	360	4810V00776B	BRACKET, DECO NON ABS, HF-380 #102
210	4950V00141B	METAL, SHIELD NON REAR AV 15LA60	370	4810V00779B	BRACKET, STAND NON ABS, HF-380 .
220	4810V00764C	BRACKET, REAR AV ML012B HIPS 40AF	380	4950V00135A	METAL, STAND NON BASE, 15LA60
230	4810V00765C	BRACKET, SIDE AV ML012B HIPS 40AF	400	3809V00338D	BACK COVER ASSEMBLY, RU-15LA60 NON .
240	4950V00142A	METAL, SHIELD, 20LA60/15LA60	430	3550V00298B	COVER, REAR 15LA60 HIPS 60HR .
250	4950V00134A	METAL, MAIN FRAME NON 15LA60	520	6871VMMQ13A	PCB, MAIN ML012B RU-15LA60
300	3091V00490D	CABINET ASSEMBLY, STEREO ML012B	530	6871VSMV38A	PCB, SUB CONT RZ-15/20LA60 CTRL ASSY
310	5020V00777B	BUTTON, CONTROL 15LA60, HF-380 7KEY	540	6633VA0003N	INVERTER, 12V NON ECT ALPS500
320	4950V00140A	METAL, SHIELD NON 15LA60	550	6871VSMV40C	PCB, SUB A/V RU-15/20LA60 SIDE A/V ASSY
330	4950V00157A	METAL, STAND NON HINGE ASSY_15LA60	560	6871VSMV43B	PCB, SUB ML012B 15 INDEX LED ASSY
340	4810V00777B	BRACKET, STAND NON ABS, HF-380 FRONT			

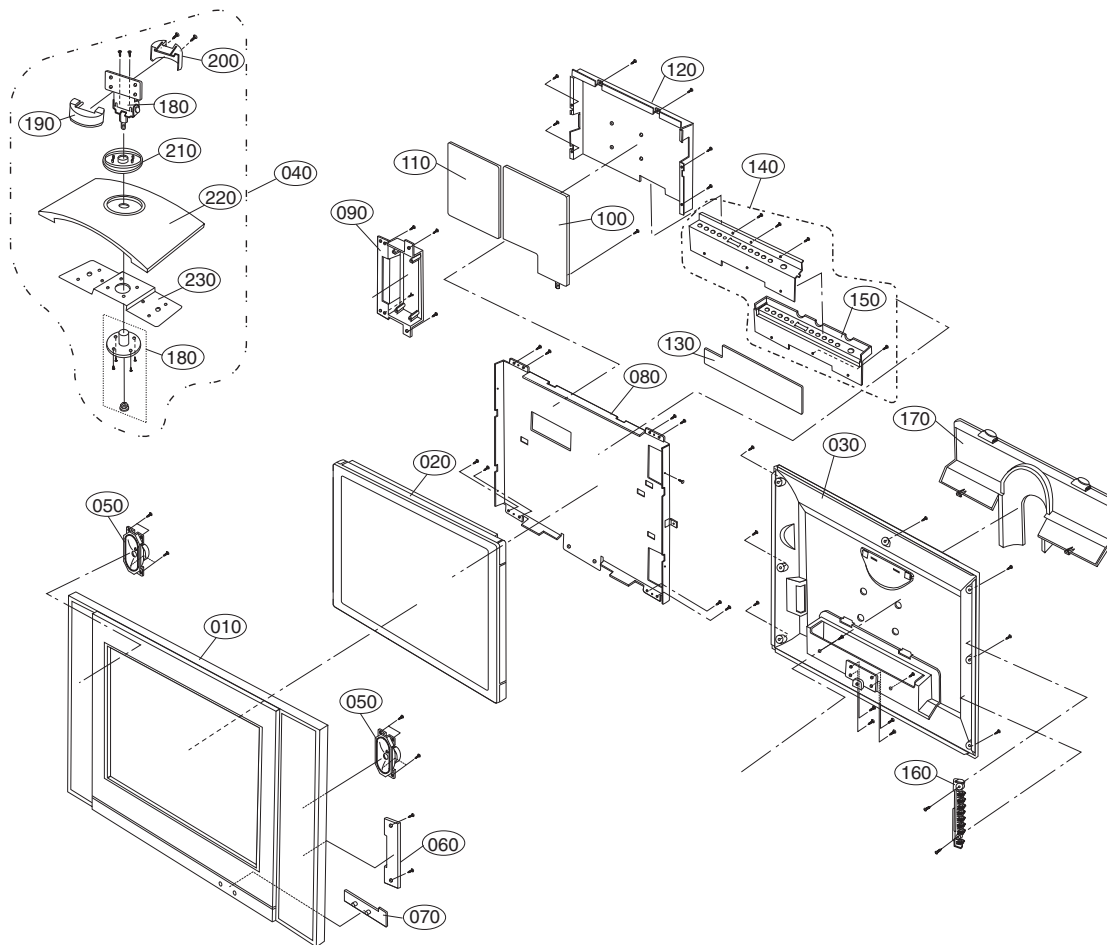
RU-15LA61 EXPLODED VIEW



RU-15LA61 Model Parts					
ITEM	PART	DESCRIPTION	ITEM	PART	DESCRIPTION
112	6306V15001A	LCD MODULE LC150X01-A3	340	4810V00777D	BRACKET,STAND ML012C HIPS 60HR FRONT
120	6400GKTX01A	SPEAKER, F1527C-6428 80HM 7/12W	350	4810V00778D	BRACKET,STAND ML012C HIPS 60HR REAR
210	4950V00141B	METAL,SHIELD NON REAR AV 15LA60	360	4810V00776C	BRACKET,DECO ML012C ABS, HF-380
220	4810V00764G	BRACKET,REAR AV ML012C HIPS 40AF	370	4810V00779C	BRACKET,STAND ML012C ABS, HF-380 BASE
230	4810V00765F	BRACKET,SIDE AV ML012C HIPS 40AF	380	4950V00135A	METAL,STAND NON BASE, 15LA60
240	4950V00142A	METAL,SHIELD NON SIDE AV, 20LA60/15LA60	400	3809V00338E	BACK COVER ASSEMBLY,RU-15LA61 NON
250	4950V00134A	METAL,MAIN FRAME NON 15LA60	430	3550V00298C	COVER,REAR AV RU-15LA61 ABS, HF-380
300	3091V00490E	CABINET ASSEMBLY,STEREO FOR CANADA	520	6871VMMQ13A	PCB ASSEMBLY,MAIN ML012C RU-15LA60
	3091V00490K	CABINET ASSEMBLY,RU-15LA61.AAPLKZ	530	6871VSMV38A	PCB ASSEMBLY,SUB CONT ML012B CONTROL ASSY
310	5020V00777C	BUTTON, CONTROL ABS, HF-380 8KEY	540	6633VA0003N	INVERTER ,12V NON ECT ALPS500 6633VA00003
320	4950V00140A	METAL, SHIELD	550	6871VSMV40J	PCB ASSEMBLY,SUB ML012B SIDE A/V
330	4950V00157A	METAL, STAND HINGE	560	6871VSMV43D	PCB ASSEMBLY,SUB ML012C 15INDEX LED ASSY

DISASSEMBLY

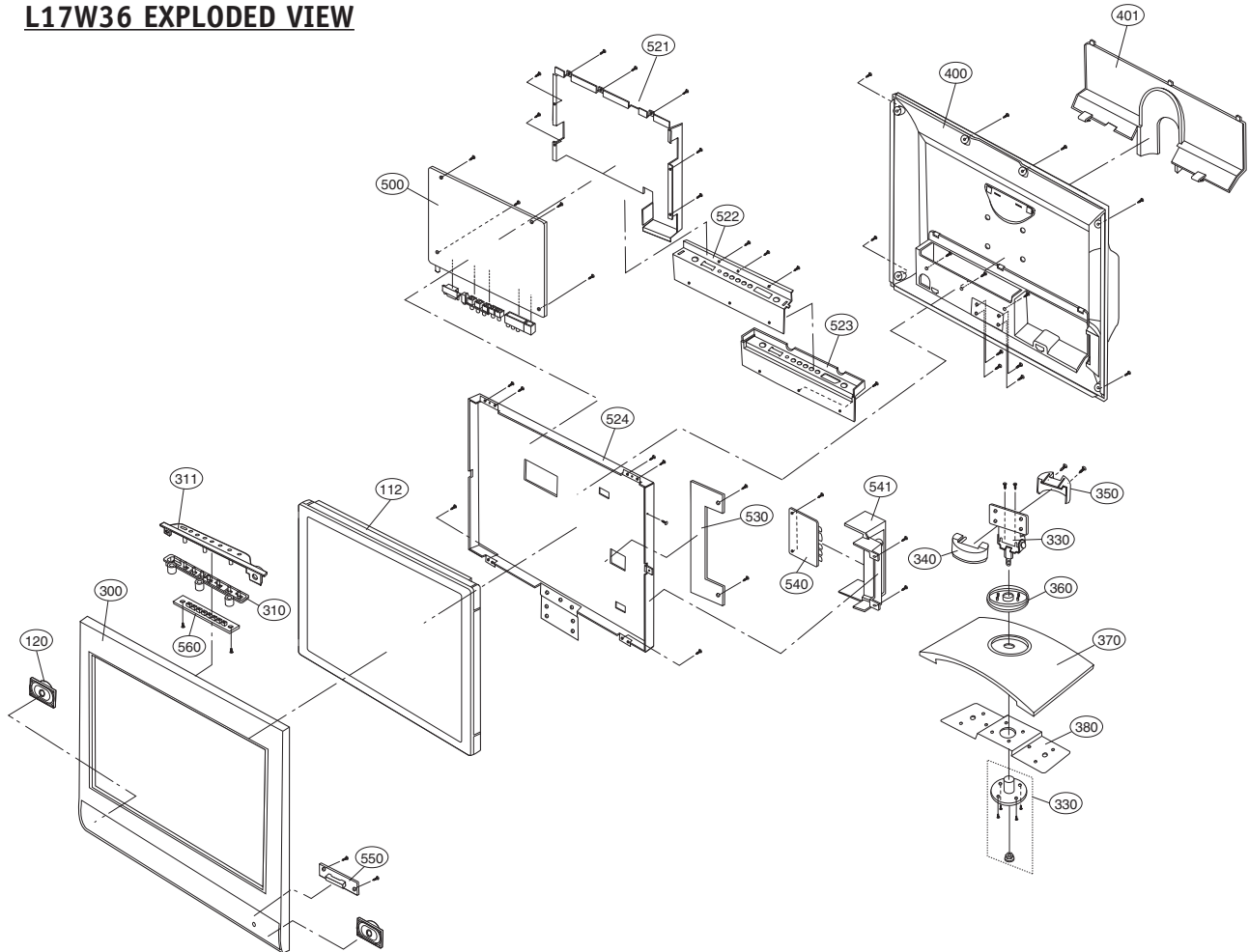
15LA6R EXPLODED VIEW



15LA6R Model Parts

ITEM	PART	DESCRIPTION	ITEM	PART	DESCRIPTION
10	3091TKB050D	CABINET, RM-15LA67 3090V00444 CANADA	110	6871TPT281E	PCB,POWER 15(LPL,CMO,HYDIS) & L173SAB(MFM)
	3091TKB050E	CABINET, 3090V00444 CANADA SKD		or 6871TPT281A	PCB,POWER, RZ-15LA70 POWER FOR CMO/LPL/HD
20	6304FLP212A	LCD, LC150X02-A4K2 LG PHILPS LEAD FREE	120	4950TKS300B	METAL, SHIELD 15LA66
	6304FLP133B	LCD, LC150X02-A4 LG PHILPS		4950TKS300A	METAL, SHIELD 15LA66 C/SKD
30	3809TKB029K	BACK COVER, 3808V00368 CANADA	130	6871TST561A	PCB, SUB RM-20LA70 ML041B JACK(DVD) BOARD ASSY
	3809TKB029L	BACK COVER, 3808V00368 CANADA SKD		6871TST964A	PCB, SUB RM/RT-15,17,20 DVD JACK BOARD VIDEO
40	3043TKK174B	TILT SWIVEL ASSEMBLY	140	3551TKK537D	COVER, RT-15LA66 REAR A/V PHONE ML041B
50	6400GKTX01C	SPEAKER, F1527C-6428-4 40*70MM	150	4810V00925G	BRACKET, REAR AV HIPS 407AF 70B
60	6871TST633A	PCB,SUB, RM-15LA66 CONTROL BOARD	160	5020V00777C	BUTTON, CONTROL RU-15LA61 ABS, HF-380 8KEY
	6871TST977A	PCB, SUB 15/20LA66 CONTROL	170	3550V00298B	COVER, REAR 15LA60 HIPS 60HR
70	6871TST635A	PCB, SUB ML-041B IR	180	4950V00157A	METAL, STAND NON HINGE _15LA60
	6871TST969A	PCB, SUB IR BOARD LED & P/SW	190	4810V00777D	BRACKET, STAND RU-15LA61 ML012C HIPS 60HR FRONT
80	4951TKS168A	METAL FRAME, MAIN LPL MODULE	200	4810V00778D	BRACKET, STAND RU-15LA61 ML012C HIPS 60HR REAR
	4951TKS168B	METAL FRAME, MAIN C/SKD LPL MODULE	210	4810V00776C	BRACKET, DECO RU-15LA61 ML012C ABS, HF-380
90	4810V00950B	BRACKET, AV RZ-20LA62 ML024A 60HR	220	4810V00779C	BRACKET, STAND RU-15LA61 ML012C ABS, HF-380 BASE
100	3313TN1008A	MAIN TOTAL ASSEMBLY, ML-041B	230	4950V00135A	METAL, STAND NON BASE, 15LA60

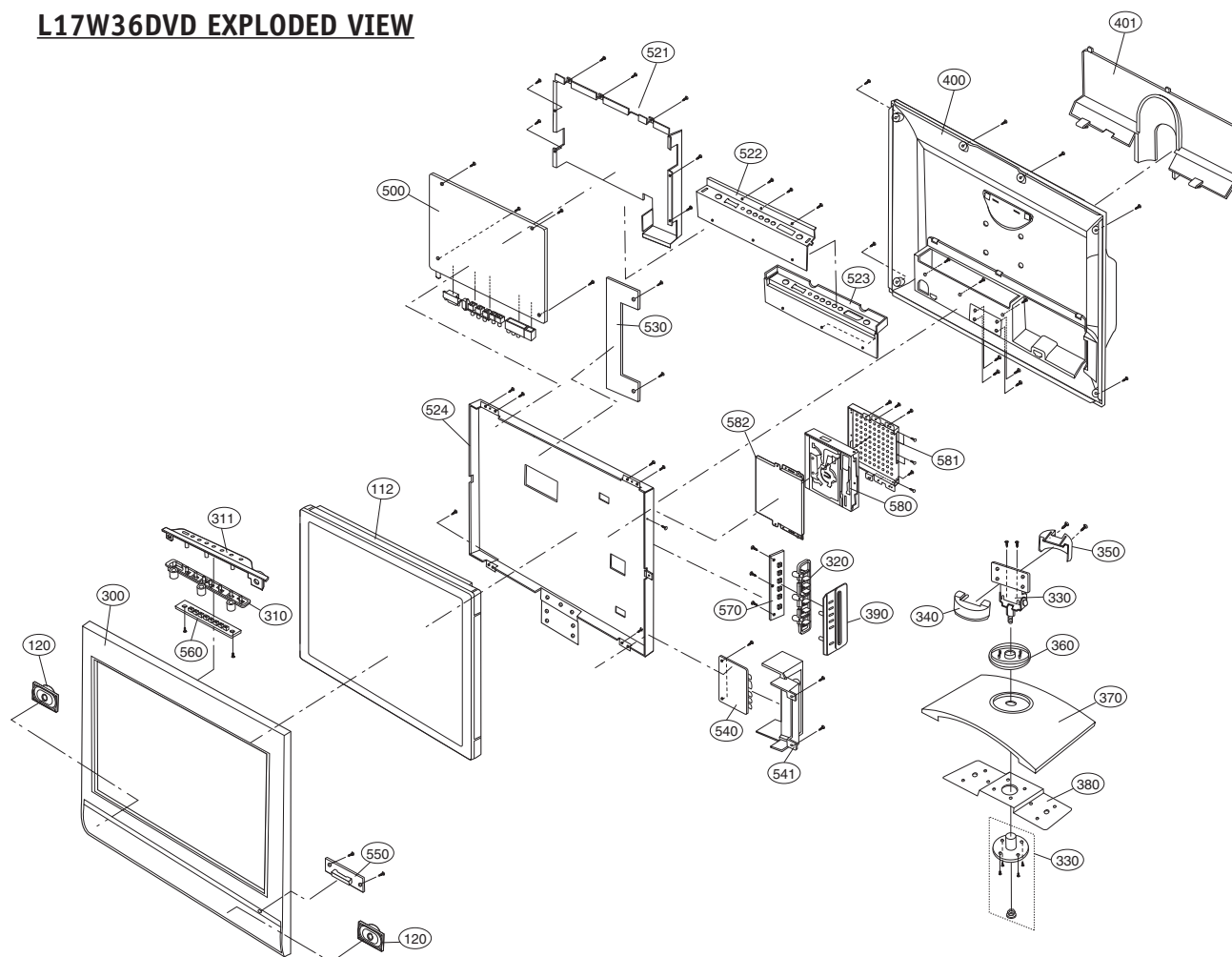
L17W36 EXPLODED VIEW



L17W36 Model Parts		
ITEM	PART	DESCRIPTION
112	6306V17001A	LCD MODULE, LC171W03-A4 LG PHILIPS TFT COLOR TFT LCD MODULE
120	6400GKT01A	SPEAKER, FULLRANGE F1527C-6428 (GENERAL) 80HM 7/12W 83DB
300	3091V00535A	CABINET ASSEMBLY, RU-17LZ20 NON ML027C .
310	5020V00798A	BUTTON, CONTROL 17LZ20 ABS 8KEY
311	4810V00836A	BRACKET, CONTROL 17LZ20
330	4950V00157A	METAL, STAND NON HINGE ASSY_15LA60
340	4810V00777A	BRACKET, STAND 15LA60 ML012B NON HINGE FRONT
350	4810V00778A	BRACKET, STAND 15LA60 ML012B NON HINGE COVER
360	4810V00776A	BRACKET, DECO 15LA60 ML012B NON STAND DECO.
370	4810V00779A	BRACKET, STAND 15LA60 ML012B NON BASE
380	4950V00135A	METAL, STAND NON BASE, 15LA60
400	3809V00371A	BACK COVER ASSEMBLY, RU-17LZ20
401	3550V00335A	COVER, REAR AV 17LZ20 ABS, HF-380
500	3141VMNQ35A	CHASSIS ASSEMBLY, MAIN ML027C
521	4950V00168A	METAL, SHIELD
522	4950V00151B	METAL, SHIELD ET
523	3500V00067E	BOARD, AV RU-17LZ20 ML027C .
524	4950V00167A	METAL, FRAME
530	6633VA0003R	INVERTER ASSEMBLY, 15V NON ECT 6LAMP CIU11-K004
540	6871VSMW58A	PCB ASSEMBLY, SUB ML027C SIDE A/V
541	4810V00838A	BRACKET, SIDE AV 17LZ20
550	6871VSMW59A	PCB ASSEMBLY, SUB WINDO ML027C INDEX ASSY
560	6871VSMW57A	PCB ASSEMBLY, SUB CONT ML027C ASSY

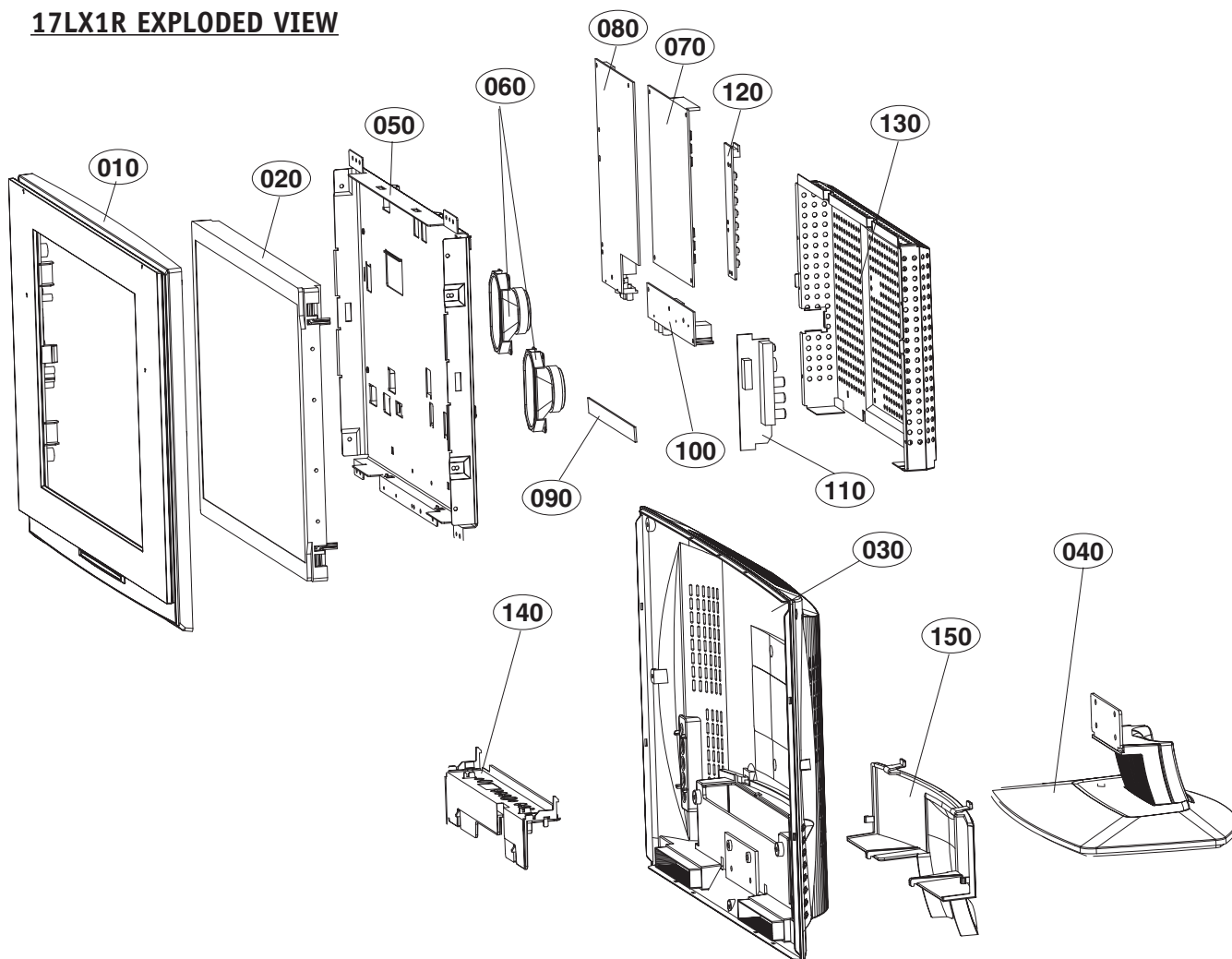
DISASSEMBLY

L17W36DVD EXPLODED VIEW



L17W36DVD Model Parts					
ITEM	PART	DESCRIPTION	ITEM	PART	DESCRIPTION
112	6306V17001A	LCD MODULE,LC171W03-A4 LG-PHILPS	500	6871VMMQ91A	PCB ASSEMBLY,MAIN ML-027B ASSY
120	6400GKTX01A	SPKR, F1527C-6428 80HM 7/12W 83DB	521	4950V00168B	METAL,SHIELD NON FOR DVD
300	3091V00535C	CABINET ASSEMBLY,KU-17LZ21 ML027B	522	4950V00191A	METAL,SHIELD ET KZ-17LZ21
310	5020V00798A	BUTTON,CONTROL 17LZ20 ABS 8KEY NON	523	4810V00896B	BRACKET,REAR AV KU-17LZ21 HIPS 40AF
311	4810V00836A	BRACKET,CONTROL 17LZ20 NON NON NON	524	4950V00167F	METAL,FRAME EGI
320	5020V00799A	BUTTON,CONTROL 17LZ21 ABS NON NON	530	6633VA0003V	INVERTER,15V 6LAMP 03T VE FRONTEC
330	4950V00157A	METAL,STAND NON HINGE ASSY_15LA60	540	6871VSMW84A	PCB ASSY,SUB A/V KZ-17LZ21 SIDE A/V
340	4810V00777A	BRACKET,STAND 15LA60 FRONT	541	4810V00838K	BRACKET,SIDE AV KU-17LZ21 HIPS 40AF
350	4810V00778A	BRACKET,STAND 15LA60 COVER	550	6871VSMX76A	PCB ASSEMBLY,SUB LED INDEX
360	4810V00776A	BRACKET,DECO 15LA60 NON STAND	560	6871VSMW86B	PCB ASSEMBLY,SUB CTL TV CONTROL
370	4810V00779E	BRACKET,STAND NON ABS, HF-380	570	6871VSMW85B	PCB ASSEMBLY,SUB CTL DVD CONTROL
380	4950V00135A	METAL,STAND NON BASE, 15LA60	580	4405V00002B	DVD-ROM,DSV-810-MMA-BBE22 DVS KOREA
390	4810V00837B	BRACKET,CONTROL 60HR FOR DVD	581	4950V00200B	METAL,SHIELD EGI DVD TOP PRESS
400	3809V00371D	BACK COVER, KU-17LZ21 NON WITH DVD	582	4950V00201B	METAL,SHIELD EGI DVD BOTTOM PRESS
401	3550V00335A	COVER,REAR AV 17LZ20 ABS, HF-380 NON			

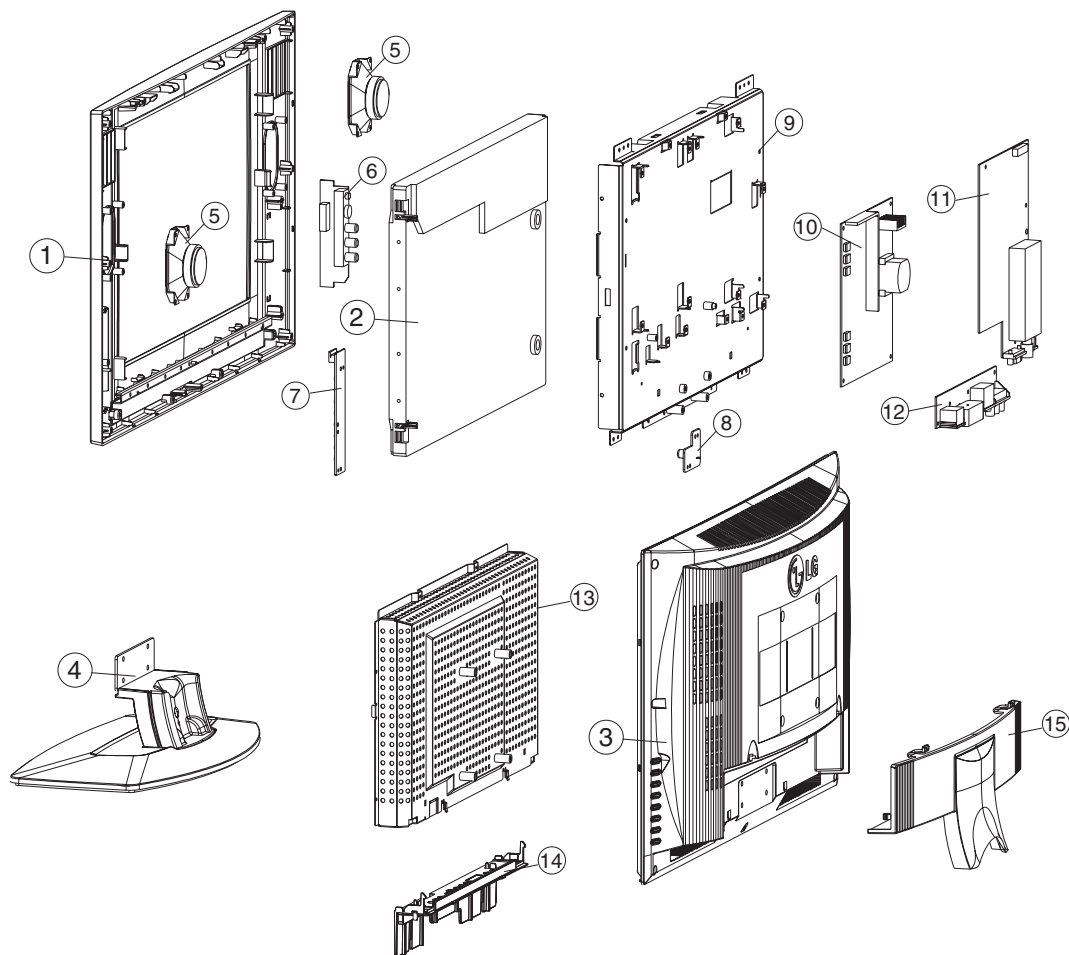
17LX1R EXPLODED VIEW



17LX1R Model Parts					
ITEM	PART	DESCRIPTION	ITEM	PART	DESCRIPTION
10	3091TKC146A	CABINET ASSEMBLY, 3090TKC106 NON	70	6871TPT280L	PCB,POWER, RZ-17LA60 LPL 17 WIDE PB FREE
	3091TKC146B	CABINET ASSEMBLY, 3090TKC106 C/SKD		or 6871TPT280C	PCB,POWER, 17RZ40 LIPS FOR LPL 17" WIDE
20	6304FLP213ALCD	LCD, LC171W03-A4KJ LEAD FREE(TV)	80	3313TN1033A	MAIN BOARD, 17LX1R-UA
	or 6306V17001B	LCD, LC171W03-A4K4	90	6871TSTA04A	PCB,SUB, 17LX1 IR BOARD LED & P/SW
	or 6304FLP140B	LCD, LC171W03-A4K7,450NITS,25MS,6LAMP	100	6871TST964A	PCB,SUB, RM/RT-15,17,20 DVD JACK BOARD
30	3809TKC061S	BACK COVER, 3808TKC051 ML-041B	110	6871TST995A	PCB,SUB, 17LX1R SIDE A/V
	3809TKC061T	BACK COVER, 3808TKC051 ML-041B C/SKD	120	6871TST976B	PCB,SUB, 17LX1R-UA CONTROL
40	3043TKK179G	TILT SWIVEL, 17LX1R NOBLE BLACK (NO PRINT)	130	4951TKK173C	REAR SHIELD RZ-17LZ50 EMI-SPONGE
	3043TKK179H	TILT SWIVEL, NOBLE BLACK C/SKD(NO PRINT)		4951TKK173D	REAR SHIELD RZ-17LZ50 EMI-SPONGE C/SKD
50	4951TKS154D	METAL FRAME ML-041B	140	3551TKK529G	COVER ASSEMBLY, REAR A/V
	4951TKS154E	METAL FRAME ML-041B C/SKD	150	3550TKK543B	COVER, 17LX1R REAR AV
60	6400GKTX01C	SPEAKER,F1527C-6428-4 40*70MM			

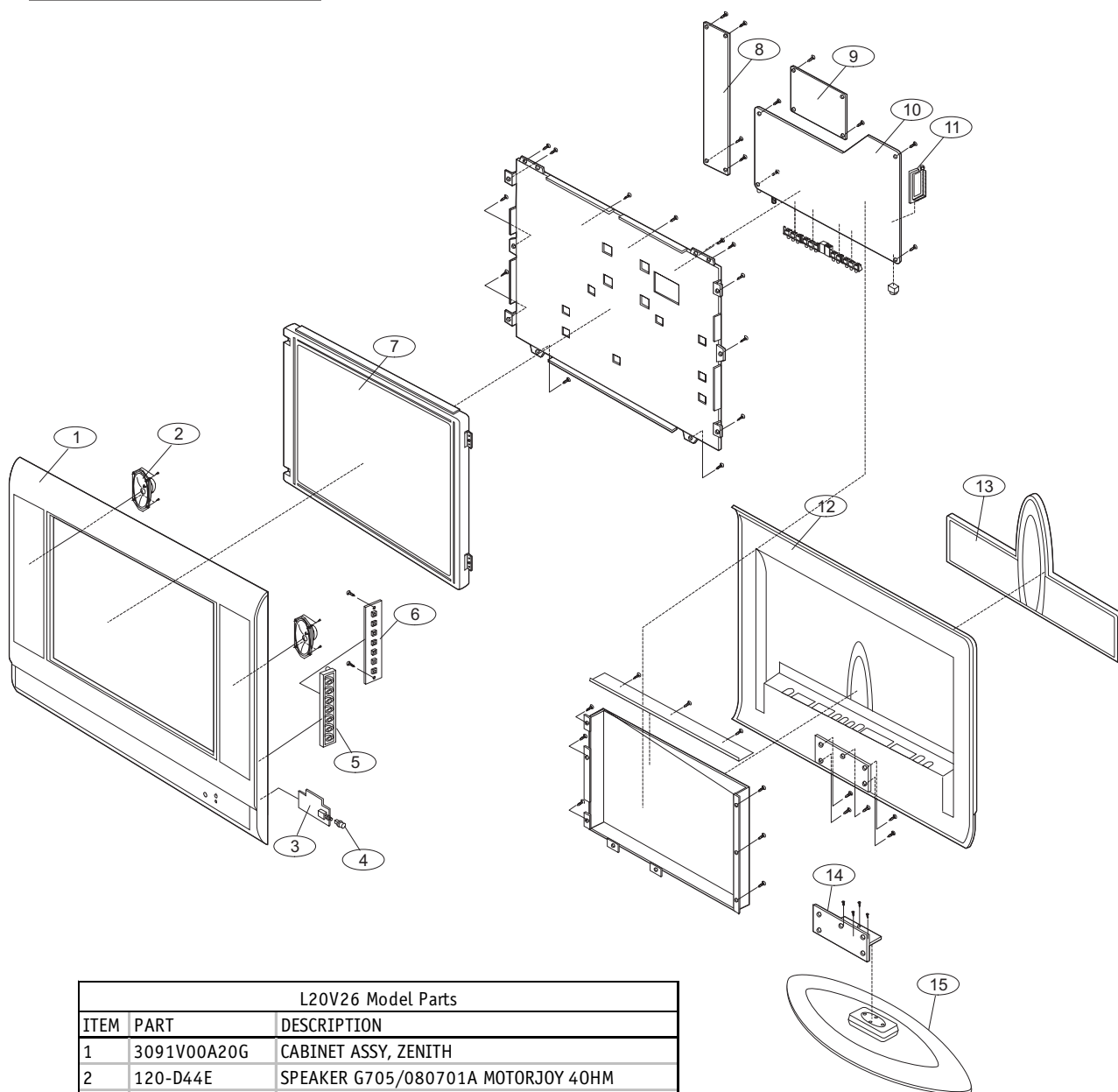
DISASSEMBLY

RU-17LZ50C EXPLODED VIEW



RU-17LZ50C Model Parts					
ITEM	PART	DESCRIPTION	ITEM	PART	DESCRIPTION
1	3091TKC120G	CABINET,3090TKC092 ML-041B C/SKD	9	4951TKS154C	METAL FRAME RZ-17LZ50 C/AKD
	3091TKC120H	CABINET, 3090TKC092 ML-041B C/SKD		4951TKS154B	METAL FRAME RM-17LZ50C
	3091TKC120F	CABINET, 3090TKC092 ML-041B	10	6871TPT280C	PCB,POWER, 17RZ40 LIPS FOR LPL 17" WIDE
2	6306V17001B	LCD, LC171W03-A4K4 LG PHILPS	11	3313TN1016B	MAIN PCB, RM-17LZ40 LPL VER 1.1
	or 6304FLP140	LCD, LC171W03-A4K7 LG PHILPS		3313TN1023B	MAIN PCB, LPL COMMERCIAL RM-17LZ50C
3	3809TKC061L	BACK COVER, ML-041B USA C/SKD	12	6871TST561A	PCB,SUB, JACK(DVD) BOARD ASSY
	3809TKC061M	BACK COVER, NORTH AMERICA COMMERCIAL		6871TST733A	PCB,SUB, JACK ASSY BOARD
4	3043TKK179D	TILT SWIVEL, RM-17LZ50 WITHOUT PRINT	13	4951TKK173B	REAR SHIELD RZ-17LZ50 C/SKD
	3043TKK179C	TILT SWIVEL, 4810TKK234 WITHOUT PRINT		4951TKK173C	REAR SHIELD RZ-17LZ50 EMI-SPONGE
5	6400GKTX01C	SPEAKER, F1527C-6428-4 40*70MM	14	3551TKK529D	COVER,REAR A/V ASSY HIPS-40AF
6	6871TST618A	PCB,SUB, SIDE_AV		3551TKK529E	COVER, REAR A/V ASSY COMMERCIAL
7	6871TST616A	PCB ,SUB, CONTROL BOARD ASSY		3550TKK543A	COVER, 17LZ50 REAR AV
8	6871TST617A	PCB, SUB, IR B/D ASSY			

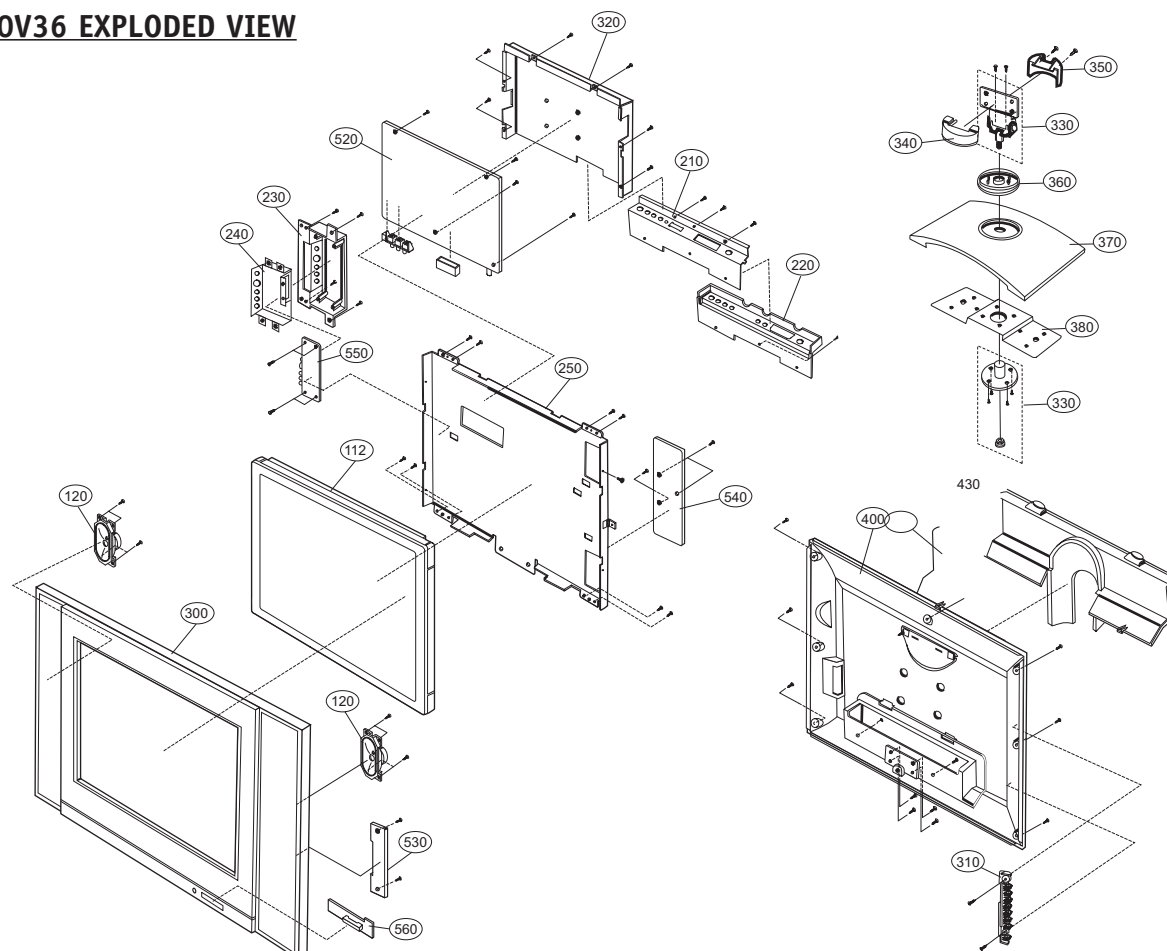
L20V26 EXPLODED VIEW



L20V26 Model Parts		
ITEM	PART	DESCRIPTION
1	3091V00A20G	CABINET ASSY, ZENITH
2	120-D44E	SPEAKER G705/080701A MOTORJOY 40HM
3	6871VSM75F	POWER PCB ASSY
4	5020V00553E	BUTTON SET (#39)
5	5020V00552H	BUTTON SET
6	6871VSM74A	CTL PCB ASSY
7	6304VT2011A	LCD,LC201V1-A1 20.1
8	6633VA0003D	INVERTER ASSY, 15VOLT KUBNKM022A
9	6871VSM814B	MX PCB ASSY
10	6871VMM644L	MAIN PCB ASSY
11	6871VSM812B	TUNER PCB ASSY
12	3809V00A10J	BACK COVER ASSY
13	3550V00202A	A/V COVER ABS
14	4950V00081B	METAL HINGE FIXER SUS304
15	4811V00019E	BRACKET ASSY

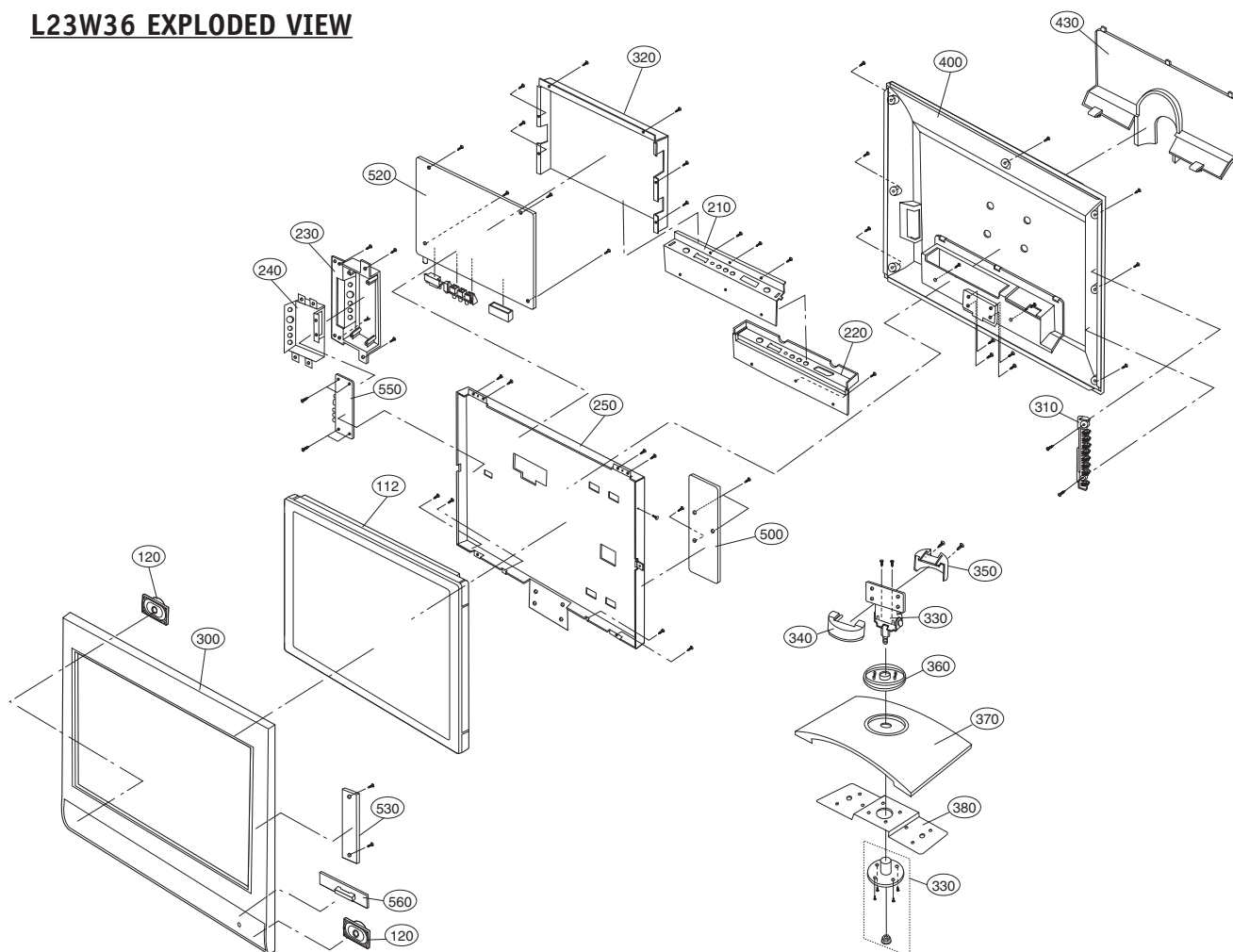
DISASSEMBLY

L20V36 EXPLODED VIEW



L20V36 Model Parts		
LOC	PART	DESCRIPTION
112	6304VT2011B	LCD MODULE,LC201V02-A3(IPS) LG PHILIPS TFT 20.1
120	6400GTX01A	SPEAKER,FULLRANGE F1527C-6428 K-TONE 80HM 7/12W
210	4950V00141A	METAL,SHIELD NON REAR AV, 20LA60
220	4810V00764D	BRACKET,REAR AV ML012B HIPS 40AF
230	4810V00765C	BRACKET,SIDE AV ML012B HIPS 40AF
240	4950V00142A	METAL,SHIELD NON SIDE AV, 20LA60/15LA60
250	4950V00132A	METAL,MAIN FRAME NON 20LA60
300	3091V00491C	CABINET ASSEMBLY,RU-20LA60 STEREO ML012B
310	5020V00776B	BUTTON,CONTROL RU-20LA60 ABS, HF-380 8KEY
320	4950V00140B	METAL,SHIELD SBHG 20LA60
330	4950V00157C	METAL,HINGE ASSY SPCC(CR) 20LA60
340	4810V00767B	BRACKET,STAND HINGE FRONT ABS, HF-380
350	4810V00768B	BRACKET,STAND HINGE COVER ABS, HF-380
360	4810V00766B	BRACKET,DECO STAND ABS, HF-380
370	4810V00769B	BRACKET,STAND ABS, HF-380 BASE
380	4950V00133A	METAL,STAND NON BASE 20LA60
400	3809V00339C	BACK COVER ASSEMBLY,RU-20LA60 NON
430	3550V00297B	COVER,REAR AV RU-20LA60 ABS, HF-380
520	6871VMMQ09A	PCB ASSEMBLY,MAIN ML012B RU-20LA60
530	6871VSMV38A	PCB ASSEMBLY,SUB CONT CONTROL ASSY
540	6633VA0003Q	INVERTER,15V NON K.S. LC201V02-A3 IPS FRONTEK
550	6871VSMV40C	PCB ASSEMBLY,SUB A/V SIDE A/V ASSY
560	6871VSMV43A	PCB ASSEMBLY,SUB ML012B 20 INDEX LED ASSY

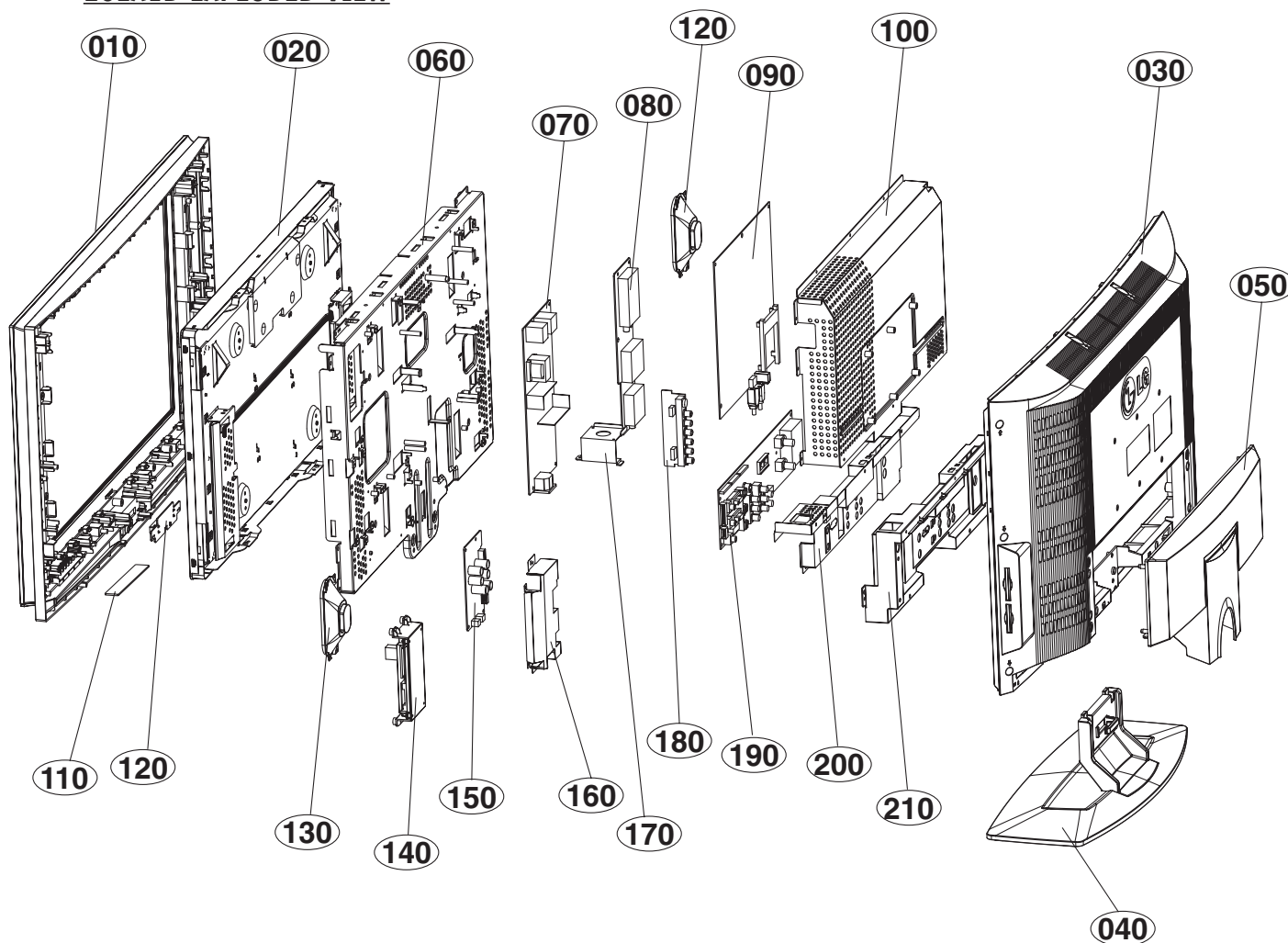
L23W36 EXPLODED VIEW



L23W36 Model Parts		
LOC	PART	DESCRIPTION
112	6306V23001A	LCD MODULE,LC230W01-A2 LG PHILIPS TFT COLOR 23 WXGA LCD
120	6400GKTX01A	SPEAKER,FULLRANGE F1527C-6428 (GENERAL) 80HM 7/12W 83DB
210	4950V00151B	METAL,SHIELD ET
230	4810V00765E	BRACKET,SIDE AV RU-23LZ20 ML027C HIPS 40AF
240	4950V00142A	METAL,SHIELD NON SIDE AV, 20LA60/15LA60
250	4950V00149C	METAL,FRAME SECC(EGI)
300	3091V00518B	CABINET ASSEMBLY,RU-23LZ20 STEREO ML027C
310	5020V00781A	BUTTON,CONTROL RZ-23LZ20 ABS 8KEY
320	4950V00150A	METAL,SHIELD SBHG RZ-23LZ20
330	4950V00157D	METAL,HINGE ASSY SPCC(CR) RZ-23LZ20
340	4810V00767A	BRACKET,STAND 20LA60 ML012B NON HINGE FRONT
350	4810V00768A	BRACKET,STAND 20LA60 ML012B NON HINGE COVER
360	4810V00766A	BRACKET,DECO 20LA60 ML012B NON STAND DECO.
370	4810V00769E	BRACKET,STAND RU-23LZ20 NON ABS, HF-380 .
380	4950V00133A	METAL,STAND NON BASE 20LA60
400	3809V00359B	BACK COVER ASSEMBLY,RU-23LZ20 NON
430	3500V00068A	BOARD,AV RZ-23LZ20 ML027A COVER REAR
520	6871VMMQ43A	PCB ASSEMBLY,MAIN ML-027C RU-23LZ20
530	6871VSMW11A	PCB ASSEMBLY,SUB CONT ML027C MANNUAL ASSY
540	6871VSMW07A	PCB ASSEMBLY,SUB POWER ML027C ASSY
550	6871VSMV40E	PCB ASSEMBLY,SUB A/V ML027C RU-23LZ20
560	6871VSMW12B	PCB ASSEMBLY,SUB WINDO ML027C INDEX MANNUAL ASSY

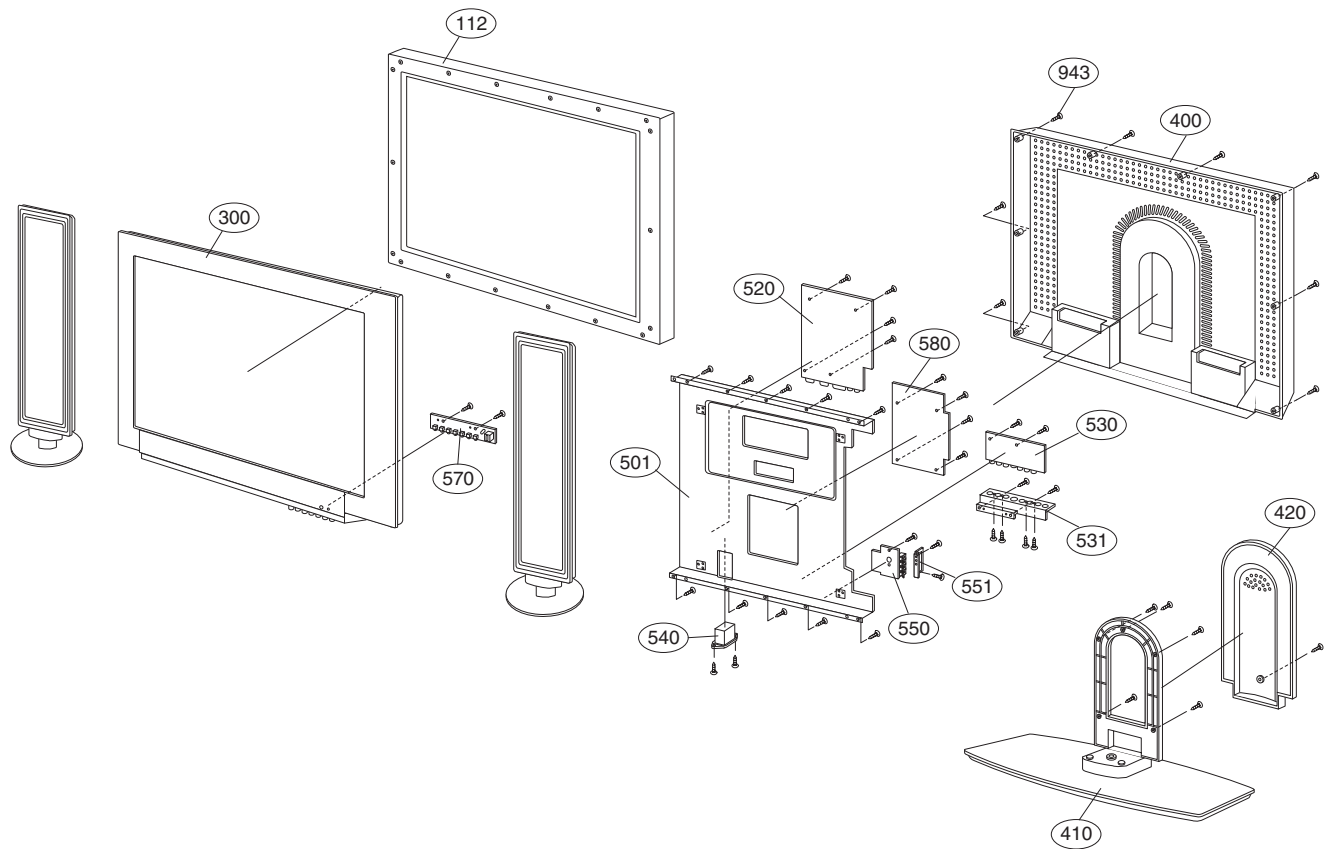
DISASSEMBLY

26LX1D EXPLODED VIEW



26LX1D Model Parts					
ITEM	PART	DESCRIPTION	ITEM	PART	DESCRIPTION
10	3091TKE032A	CABINET DU-26LG10 3090TKE024Y	110	6871TSTA48A	CONTROL PCB 26/32LX1D-U KEY CONTROL SUB
	3091TKE032B	CABINET, 26LX1D BRAND DU C/SKD	120	6871TST937A	IR&LIGHT PCB 26LX1D-U
20	6304FLP190A	LCD, LC260WX2-SL03 LG PHILIPS IPS WIDE	130	6400GESF01A	SPEAKER, C112A02K1450 ESTEC 80HM 10/15W
30	3809TKE029A	BACK COVER, DU-26LG10 3808TKE024	140	3141TZZ174A	CHASSIS ASSEMBLY, 26LX1D-UA EPF OARD
	3809TKE029C	BACK COVER, 26LX1D ML-051A C/SKD	150	6871TST940A	AUDIO PCB 26LX1D-U
40	3043TKK171G	TILT SWIVEL, 26LX1D BK AL-04DA	160	4810TKK302A	BRACKET, DU-26LG10 REAR BRACKET EPF
	3043TKK171H	TILT SWIVEL, 26LX1D BK AL-04DA C/SKD	170	4951TKK262A	SUPPORT FAN ASSEMBLY 5900V05005A
50	3550TKK816A	COVER, DU-26LG10 REAR AV		4951TKK262B	SUPPORT FAN ASSEMBLY 5900V05005B
60	4951TKS211A	MAIN FRAME ASSEMBLY DU-26LG10	180	6871TST938A	SIDE A/V ASSEMBLY, 26LX1D-U
	4951TKS211C	MAIN FRAME ASSEMBLY 26LX1D C/SKD	190	3313TD2001A	ANALOG ASSEMBLY, 26LX1D-U AL-04DA
70	6871TPT303B	POWER PCB, DU(DCR) COMM-SH(D112)	200	4950TKA191A	METAL, REAR SHIELD, DU-26LG10
80	6871TST939A	TUNER PCB 26LX1D-U		4950TKA191B	METAL, REAR SHIELD, DU-26LX1D C/SKD
90	3313TD2002A	DIGITAL/MAIN ASSEMBLY AL-04DA	210	3551TKK572A	COVER ASSEMBLY, DU-26LG10 REAR . AV ASSY
100	4951TKK258A	SHIELD ASSEMBLY, 26LX1D			
	4951TKK258D	SHIELD ASSEMBLY, 26LX1D-UA C/SKD			

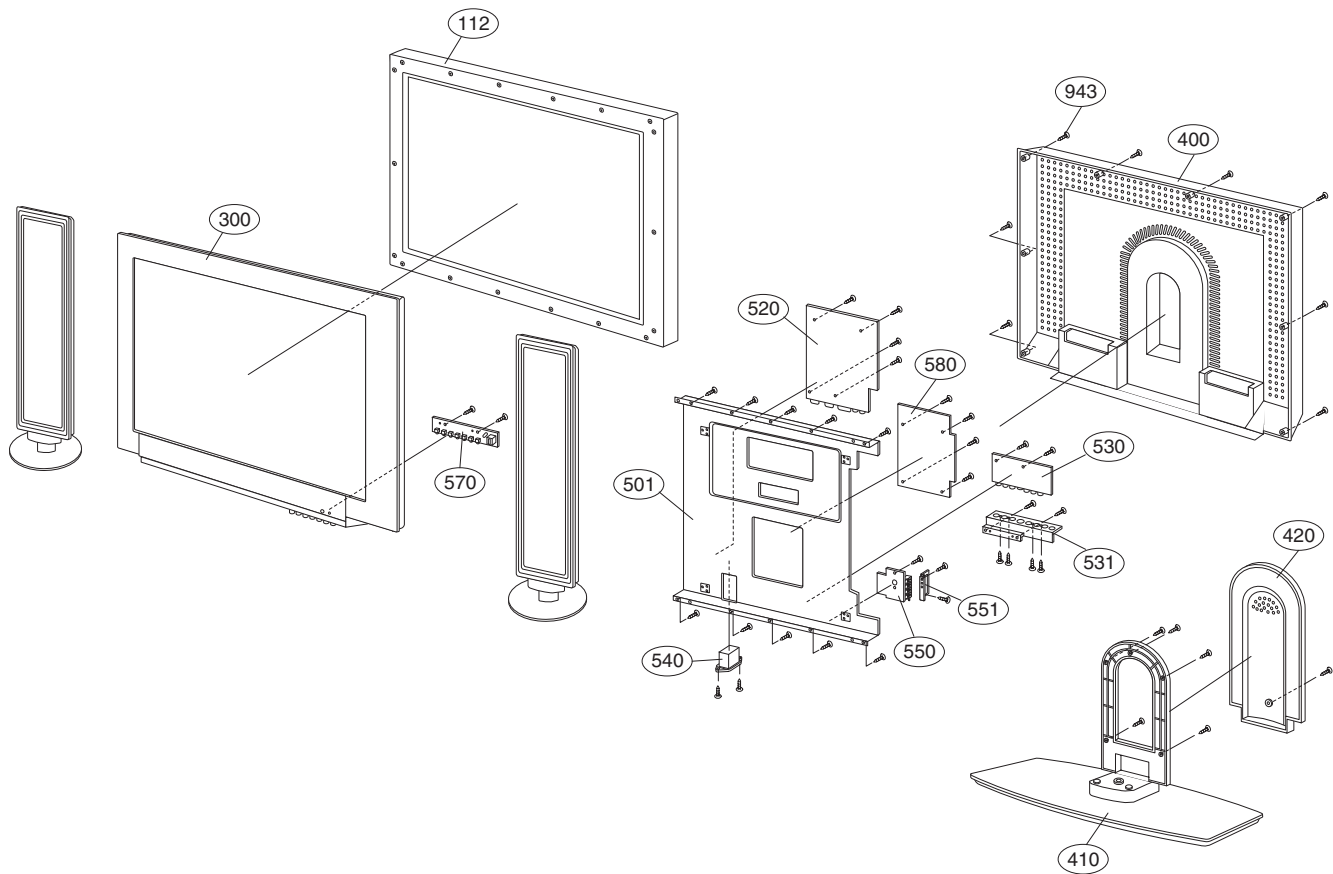
L30W26 EXPLODED VIEW



L30W26 Model Parts		
LOC	PART	DESCRIPTION
112	6305V00001A	LCD ASSEMBLY,30" LCD PANEL LC30W01-A3 AND I
300	3091V00A73B	CABINET ASSEMBLY
400	3809V00A33B	BACK COVER ASSEMBLY
410	3501V00083A	BOARD ASSEMBLY,BASE MW-30LZ10
420	3508V00306A	DECO,REAR COVER
501	4980V00505B	SUPPORTER ASSY,MODULE
520	6871VMN648A	PCB ASSEMBLY,MAIN MF-02HA MW-30LZ10 MAIN BO
530	6871VSN182B	PCB ASSEMBLY,SUB A/V MF-02HA MW-30LZ10 AV BOARD
531	4930V00226E	HOLDER,AV
540	3141VPN048A	CHASSIS ASSEMBLY,SMPS MF-02HA LCD30 SWITCH
550	6871VSN181A	PCB ASSEMBLY,SUB SPK MF-02HA MW-30LZ10 SPK BOAR
551	4930V00224C	HOLDER,SPK JACK
560	6633VA0004A	INVERTER ASSEMBLY,24VOLT 1100VOLT K.S. KLS300W1
570	6871VSN180A	PCB ASSEMBLY,SUB CONT MF-02HA MW-30LZ10 CONTROL
580	3501V00091A	BOARD ASSEMBLY,SMPS PFC MW-30LZ10 MF-02HA LCD
943	1FBF0403122	SCREW,D4.0 L16.0

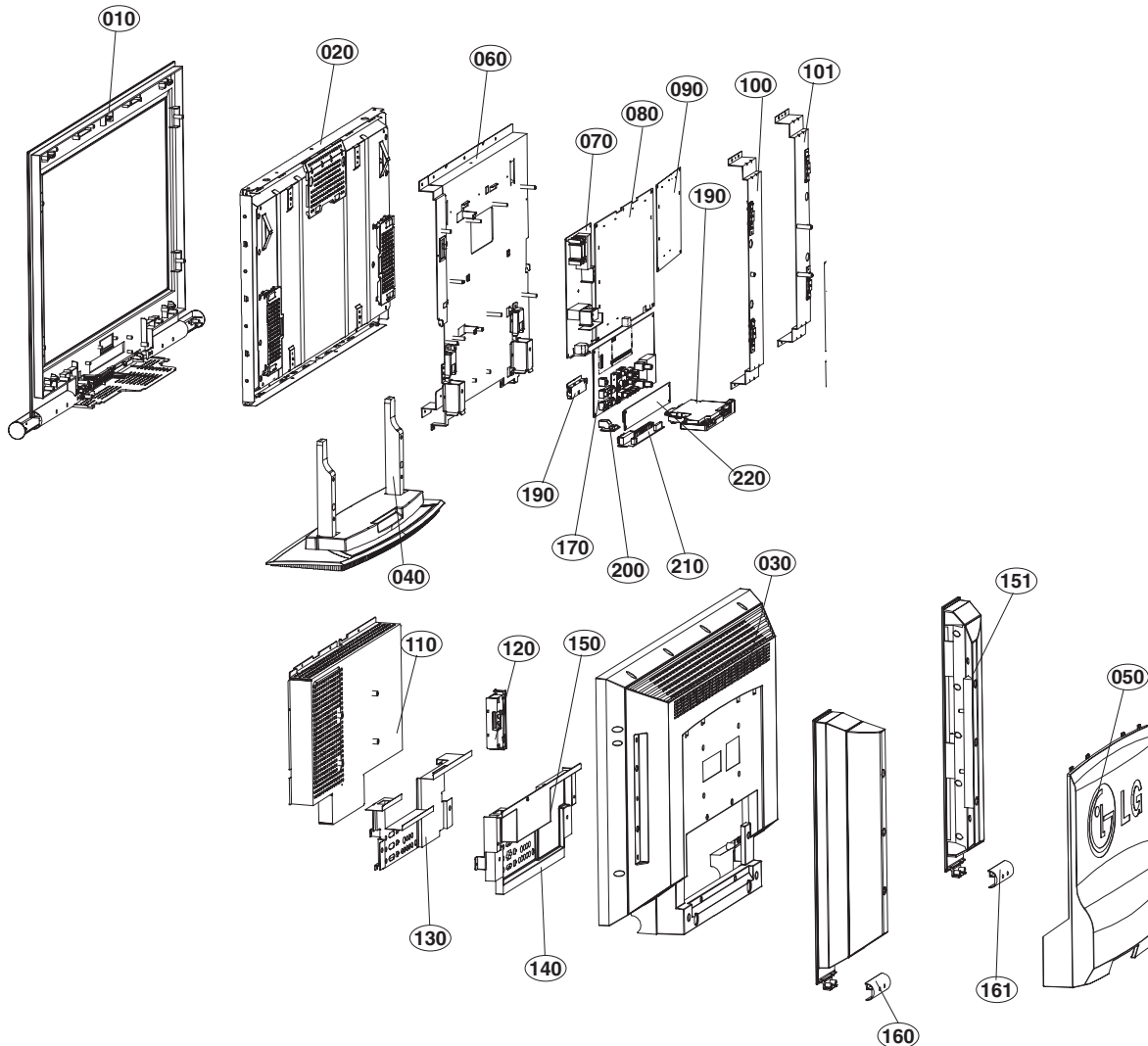
DISASSEMBLY

L30W36 EXPLODED VIEW



L23W36 Model Parts		
LOC	PART	DESCRIPTION
112	6305V00001A	LCD ASSEMBLY,30" LCD PANEL LC30W01-A3 AND I
300	3091V00A73E	CABINET ASSEMBLY
400	3809V00A33B	BACK COVER ASSEMBLY
	3809V00A33D	BACK COVER ASSEMBLY
410	3501V00083A	BOARD ASSEMBLY,BASE MW-30LZ10
420	3508V00306A	DECO,REAR COVER
501	4980V00505B	SUPPORTER ASSY,MODULE
520	6871VMN648A	PCB ASSEMBLY,MAIN MF-02HA MW-30LZ10 MAIN
	6871VMN637A	PCB ASSEMBLY,MAIN MF-02HA MW-30LZ10 MAIN
530	6871VSN182B	PCB ASSEMBLY,SUB A/V MF-02HA MW-30LZ10 AV
531	4930V00226E	HOLDER,AV
540	3141VPN048A	CHASSIS ASSEMBLY,SMPS MF-02HA LCD30 SWITCH
550	6871VSN181A	PCB ASSEMBLY,SUB SPK MF-02HA MW-30LZ10 SPK
551	4930V00224C	HOLDER,SPK JACK
560	6633VA0004A	INVERTER ASSEMBLY,24VOLT 1100VOLT K.S. KLS300W1
570	6871VSN180A	PCB ASSEMBLY,SUB CONT MF-02HA MW-30LZ10 CONTROL
580	3501V00091A	BOARD ASSEMBLY,SMPS PFC MW-30LZ10 MF-02HA LCD
943	1FBF0403122	SCREW,D4.0 L16.0

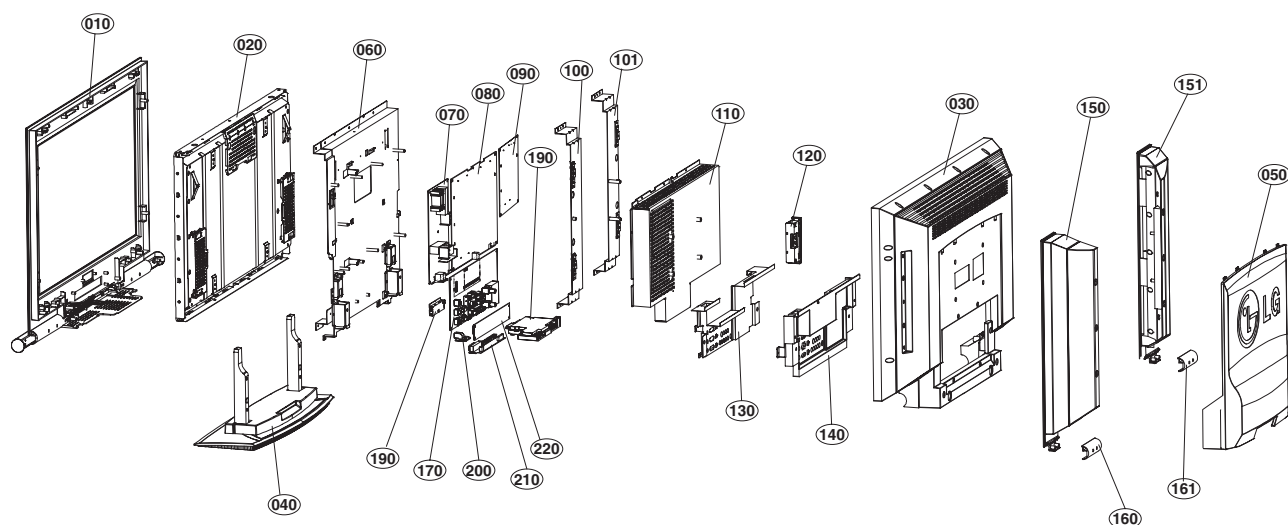
32LP1D EXPLODED VIEW



32LP1D Model Parts					
ITEM	PART	DESCRIPTION	ITEM	PART	DESCRIPTION
10	3091TKE023B	CABINET, 32LP10 3090TKE019 BLACK, DU	110	4951TKK238G	METAL ASSEMBLY, FRAME REAR 32LP1D
	3091TKE023G	CABINET, 3090TKE019 BLACK, FOR CKD		4951TKK238H	METAL ASSEMBLY, FRAME REAR 32LP1D, CKD
20	6304FLP290A	LCD, LC320W01-A6K6 LG PHILIPS AIODC	120	6871TSTB40A	SIDE AV SUB PCB, 32LP1D-UA ETC .
	or 6304FLP181A	LCD, LC320W01-A6K3 LG PHILPSLAI ODC	130	4951TKK263B	METAL ASSEMBLY, REAR SHIELD
30	3809TKE022D	BACK COVER,3808TKE020 WHITH HOLDER	140	3551TKK561B	REAR AV COVER, 32LP10-DU BRACKET
	3809TKE022E	BACK COVER,3808TKE020 WHITH HOLDER		3551TKK561G	REAR AV COVER, 32LP1D-UA BRACKET, CKD
40	3043TKK214B	TILT SWIVEL ASSEMBLY, 32LP10 . FOR DU	150	3551TKS058B	SPEAKER COVER, 32LP10 BLACK
	3043TKK214E	TILT SWIVEL ASSEMBLY, 32LP1D-UA CKD	151	3551TKS058B	SPEAKER COVER, 32LP10 BLACK
50	3550TKK714A	COVER, 32LP10 REAR A/V	160	4950TKA058A	METAL, PLATE AL DECO REAR SPEAKER L
	3550TKK714B	COVER, 32LP10 REAR A/V FOR CKD	161	4950TKA058A	METAL, PLATE AL DECO REAR SPEAKER L
60	4951TKS193B	METAL ASSEMBLY, FRAME 32LP10-DU	170	6871TST754A	SUB PCB, DU-32LP10 ETC TUNER
	4951TKS193F	METAL ASSEMBLY, FRAME 32LP1D-UA CKD	180	3141TZZ173A	CHASSIS ASSEMBLY, 32LP1D-U EPF BOARD
70	6871TPT303B	POWER PCB, DU/DN/DI-32LP10 (DCR)	190	6871TSTA93A	SUB PCB, 32LP1D-UA LOGO ETC TOTAL
80	3313TD3049A	MAIN, 32LP1D-UA DIGITAL AL-04DA	200	6871TSTA73A	IR SUB PCB, 32LP1D-U TOTAL
90	3313TD3047A	MAIN, 32LP1D-UA ANALOG AL-04DA	210	6871TSTB39A	FRONT CONTROL SUB PCB
100	4951TKK228B	METAL ASSEMBLY, FRAME SIDE R(32LP10)	220	6871TSTA24A	VFD LED & P/SW SUB PCB
101	4951TKK228B	METAL ASSEMBLY, FRAME SIDE R(32LP10)			

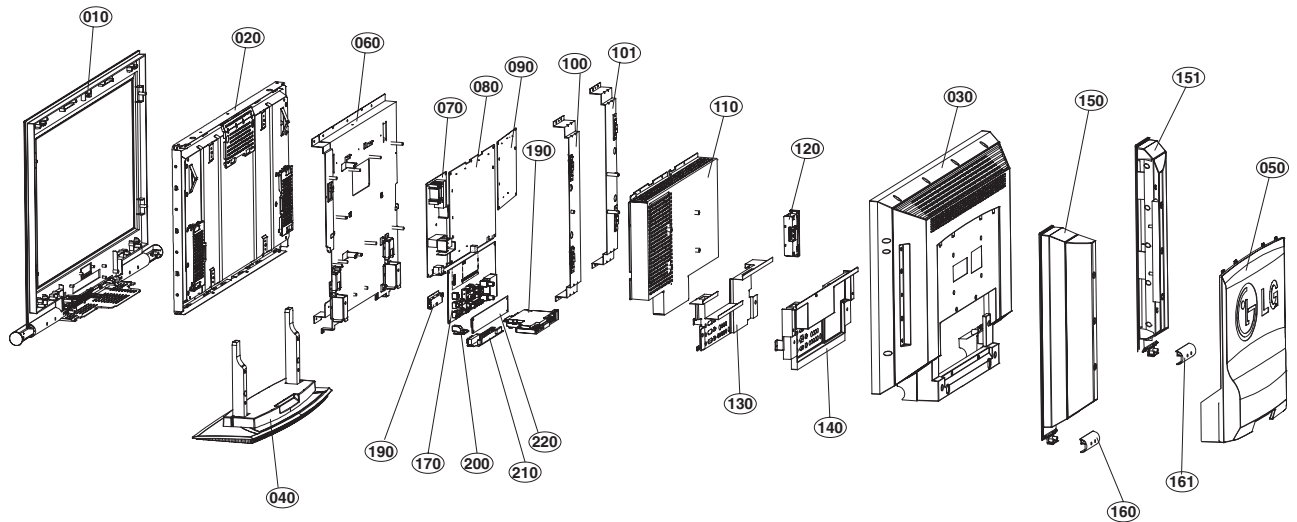
DISASSEMBLY

37LP1D EXPLODED VIEW



42LP1D Model Parts					
ITEM	PART	DESCRIPTION	ITEM	PART	DESCRIPTION
10	3091TKE028C	CABINET ASSEMBLY, 37LP1D-UA BRAND	101	4951TKK262C	FAN SUPPORT 5900V05005A (37LP10 ONLY)
	3091TKE028F	CABINET ASSEMBLY, 37LP1D-UA (C/SKD)	110	4951TKS240A	REAR SHIELD ASSY
20	6304FLP291A	LCD, LC370W01-C6K1 LG PHILIPS ODC		4951TKS240B	REAR SHIELD ASSY(C/SKD)
	or 6304FLP178A	LCD, LC370W01-C6 LG PHILIPS P6 PLANT, ODC	120	6871TSTA23A	SIDE A/V PCB, 37LP1D-UA ETC
30	3809TKE026A	BACK COVER, 37LP10	130	4950TKA120B	AV REAR SHIELD 37LP1D-UA/37LP1D-NA
	3809TKE026D	BACK COVER, 37LP1D-UA(C/SKD)	140	3551TKK586B	REAR AV BRACKET COVER 37LP1D-U
40	3043TKK224B	TILT SWIVEL STAND 37LP1D-UA (SET)	150	3551TKS063B	SPEAKER COVER 37LP1D-UA BLACK
	3043TKK224D	TILT SWIVEL STAND 37LP1D-UA (C/SKD)	151	3551TKS063B	SPEAKER COVER 37LP1D-UA BLACK
50	3550TKK768A	COVER, 37LP10 REAR	160	4950TKA131A	METAL SUPPORT AL DECO SPK REAR LEFT
	3550TKK768B	COVER, 37LP10 REAR C/SKD	161	4950TKA132A	METAL SUPPORTAL DECO SPK REAR RIGHT
60	4951TKS213B	METAL FRAME, 37LP1D-UA, 37LP1D-NA	170	6871TSTA25A	TUNER PCB, 37LP1D-UA ETC
	4951TKS213D	METAL FRAME, 37LP1D-UA(C/SKD)	180	3141TZZ177A	CHASSIS ASSEMBLY, 37LP1D-U EPF ASSY
70	6871TPT315A	POWER PCB 37-42 DCR KNPOWERTEK	190	6871TSTB31A	LOGO PCB ASSEMBLY, 37LP1D-UA
80	3313TD3050A	DIGITAL PCB, 37LP1D-UA AL-04DA	200	6871TSTA73A	IR PCB,SUB, 32LP1D-U
90	3313TD3048A	ANALOG PCB, 37LP1D-UA AL-04DA	210	6871TSTB41A	FRONT CONTROL PCB 37LP1D-UA.
100	4951TKK262C	FAN SUPPORT 5900V05005A(37LP10 ONLY)	220	6871TSTA24A	LED & P/SW PCB, 37LP1D-UA VFD

42LP1D EXPLODED VIEW



42LP1D Model Parts					
ITEM	PART	DESCRIPTION	ITEM	PART	DESCRIPTION
10	3091TKE031B	CABINET 42LP10 3090TKE023A (UA)	101	4951TKK262A	SUPPORT FAN ASSY 5900V05005A
	3091TKE031F	CABINET 42LP10 3090TKE023A (UA-SKD)	110	4951TKK276K	SHIELD AV ASSY, 42LP1D-UA
20	6304FLP286A	LCD LC420W02-B4K4 LG PHILPS B4K3 REV	120	6871TSTA27A	SIDE A/V PCB 42LP1D-UA ETC
	or 6304FLP216A	LCD LC420W02-B4K3 LG PHILPS LEAD FREE	130	4950TKA120F	REAR AV METAL SHIELD 42LP1D-UA,NA
	6304FLP295A	LCD LC420W02-B6K1 LG PHILPS B6+STATUS PIN	140	3551TKK597B	REAR A/V COVER 42LP1D (UA)
30	3809TKE028B	BACK COVER, 3808TKE023 (NO SERVICE LABEL)	150	3551TKS061B	SPEAKER COVER, 42LP1D LEFT(UA,BLACK)
	3809TKE028C	BACK COVER, 3808TKE023 (SKD-NO SERVICE LABEL)	151	3551TKS062B	SPEAKER COVER, 42LP1D RIGHT(UA,BLACK)
40	3043TKK238B	TILT SWIVEL STAND (UA)	160	4950TKA189A	METAL, FIX AL DECO REAR PIECE
	3043TKK238D	TILT SWIVEL STAND (UA) SKD	161	4950TKA189A	METAL, FIX AL DECO REAR PIECE
50	3550TKK812A	COVER, 42LP10 REAR (DECO)	170	6871TSTA29A	TUNER PCB, 42LP1D-UA TUNER ETC
	3550TKK812B	COVER, 42LP10 REAR (DECO-SKD)	180	3141TZZ178A	CHASSIS ASSEMBLY, 42LP1D-U EPF ASSY
60	4951TKS210B	FRAME ASSEMBLY (42LP10,UA)	190	6871TSTB32A	LOGO PCB, 42LP1D-UA LOGO
70	6871TPT315A	POWER PCB, 37-42 DCR KNPOWERTEK	200	6871TSTA73A	IR PCB,SUB, 32LP1D-U IR SUB
80	3313TD4015A	DIGITAL PCB, 42LP1D-UA AL-04DA	210	6871TSTB42A	FRONT CONTROL PCB,SUB, 42LP1D-UA
90	3313TD4014A	ANALOG PCB, 42LP1D-UA AL-04DA	220	6871TSTA24A	LED & P/SW PCB, 37LP1D-UA VFD
100	4951TKK262A	SUPPORT FAN ASSY 5900V05005A			

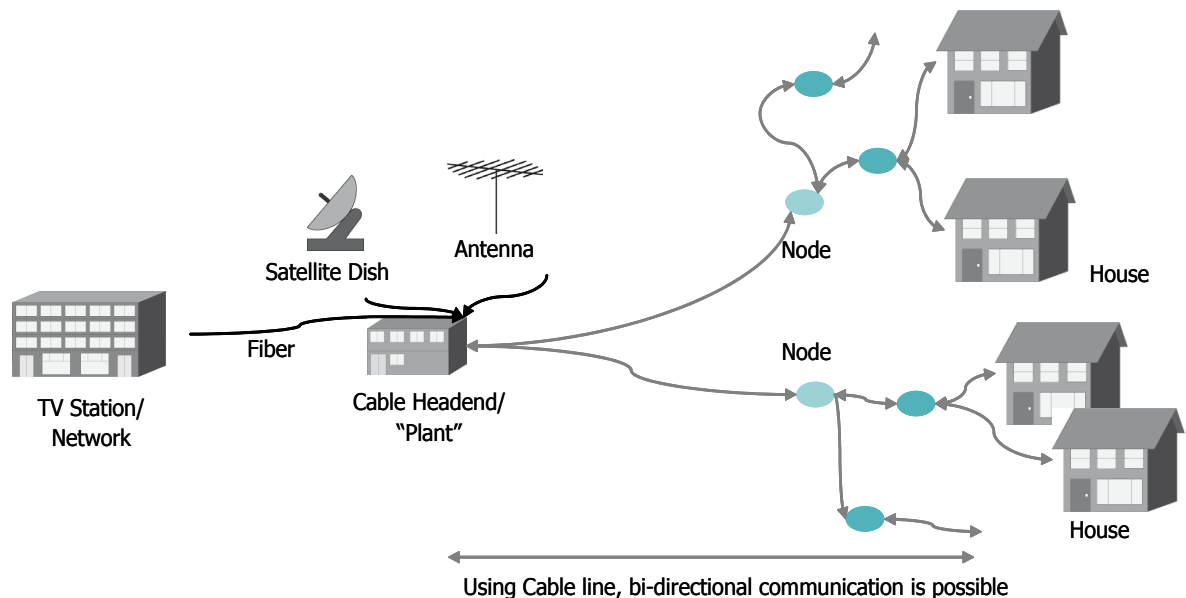
CABLECARD

DIGITAL CABLE READY (DCR)

A “plug-and-play” DTV is a television that you can plug directly into your cable system and receive analog and most digital cable services without the need for a set-top box. The cable and consumer electronics industries have dubbed these types of televisions “digital cable ready” or “DCR.”

Digital plug-and-play will not work quite like analog. For digital plug-and-play, you’ll probably need to get a security card (also known as a CableCARD™) from your local cable operator. The security card will permit you to watch scrambled programming and premium services, to which you’re subscribed.

A CableCARD device is a PCMCIA card distributed by cable operators and inserted into a DCR TV(Host) to enable premium services, also called “Card” and “Point of Deployment(POD) module”. It provides authorization, CA (Conditional Access) decryption and CP (Copy Protection) encryption functions for the consumer’s DCR TV.



CEA-NCTA AGREEMENT

- Signed Dec 19, 2002
- An agreement between cable operators and the consumer electronics industry
- How to offer digital programming over cable lines to current and future digital televisions without the need for a set-top box
- “Unidirectional” cable-ready digital television sets (called UDCP or UDRD)
 - * Conditional access mechanism
 - * Separate CableCARD (POD) card
 - * Only receive information from the headend (one-way)
- Cable industry: Comcast, Cox, Time Warner, etc. (8 companies)
- CE industry: Philips, Panasonic, Zenith, Samsung, Sony, etc (14 companies)
- First Verification started Feb 2004 (VW18) based on PICS/ATP

CABLECARD

- DCR TV can receive:
 - * Off-air HD/HD through cable
 - * Off-air/Cable Analog & Digital
- But, DCR TV doesn't support:
 - * VOD, Impulse PPV
 - * EPG service provided by MSO

TERMS

CEA: Consumer Electronics Association

NCTA: National Cable & Telecommunications Association

POD: Point-Of-Deployment

UDCP: Uni-Directional Cable Product, UDRD : Uni-Directional Receiving Device

DCR: Digital Cable Ready

PICS: Protocol Implementation Conformance Statements

ATP: Acceptance Test Plan

PPV: Pay Per View

Off-air: Terrestrial retransmission through cable

Inband tuner: FAT tuner

OOB tuner: FDC tuner

CA: Conditional Access

CP: Copy Protection

OOB: Out Of Band

RDC: Reverse Data Channel

OOB: Out of Band

FDC: Forward Data Channel

FAT: Forward Application Transport

PSI: Program Service Information

SI: Service Information

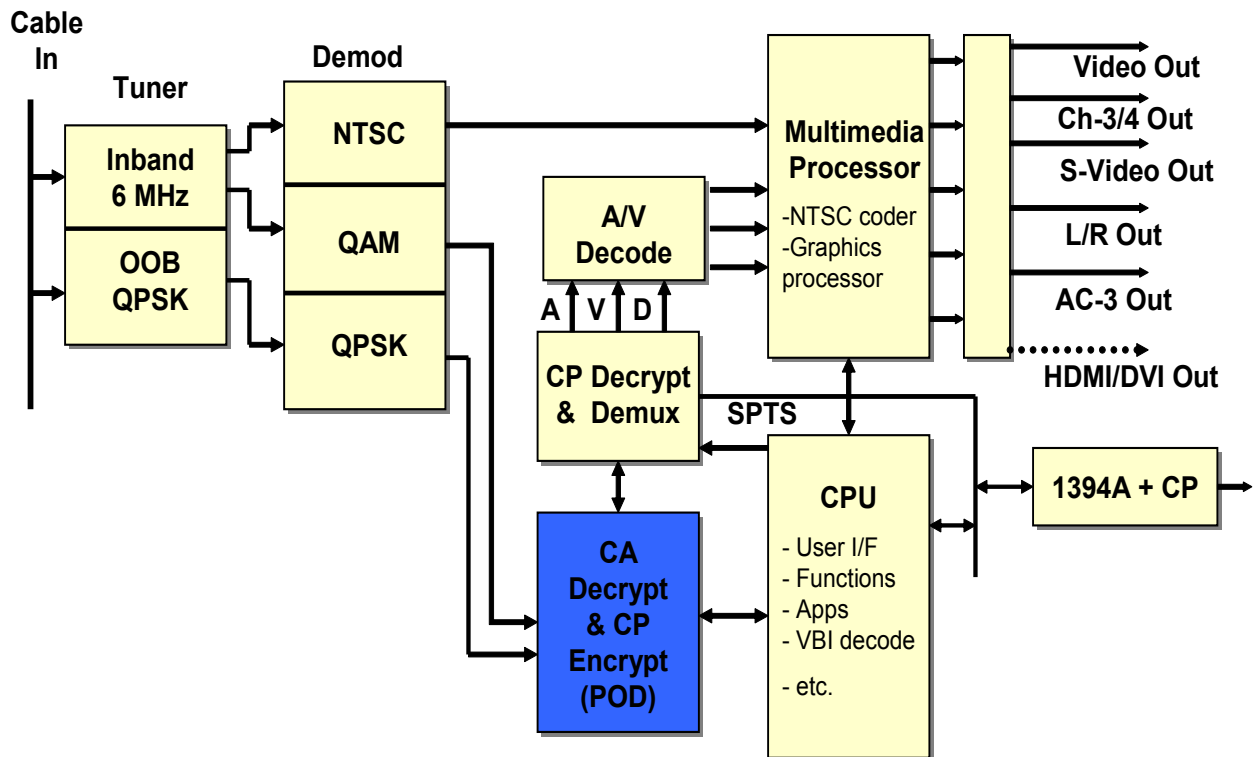
Clear channel: Any channel that is not scrambled or encrypted. Thus the customer will be able to receive these channels with only basic cable service.

Scrambled/Encrypted Channels: Channels that are scrambled or encrypted and require additional equipment to receive these channels. EX: Cablecard or cable box.

VENDORS

- CableCARD (POD) vendors:
 - Motorola, Scientific Atlanta, SCM/NDS
- Cable HeadEnd vendors:
 - Motorola, Scientific Atlanta, Harmonic
- Cable MSO (Multiple System Operators)
 - Comcast, Time Warner, Charter, Cox, Adelphia, Bright House, Mediacom, Insight, CSC Holdings, Cable One, Advance/Newhouse, etc.

DCR ARCHITECTURE

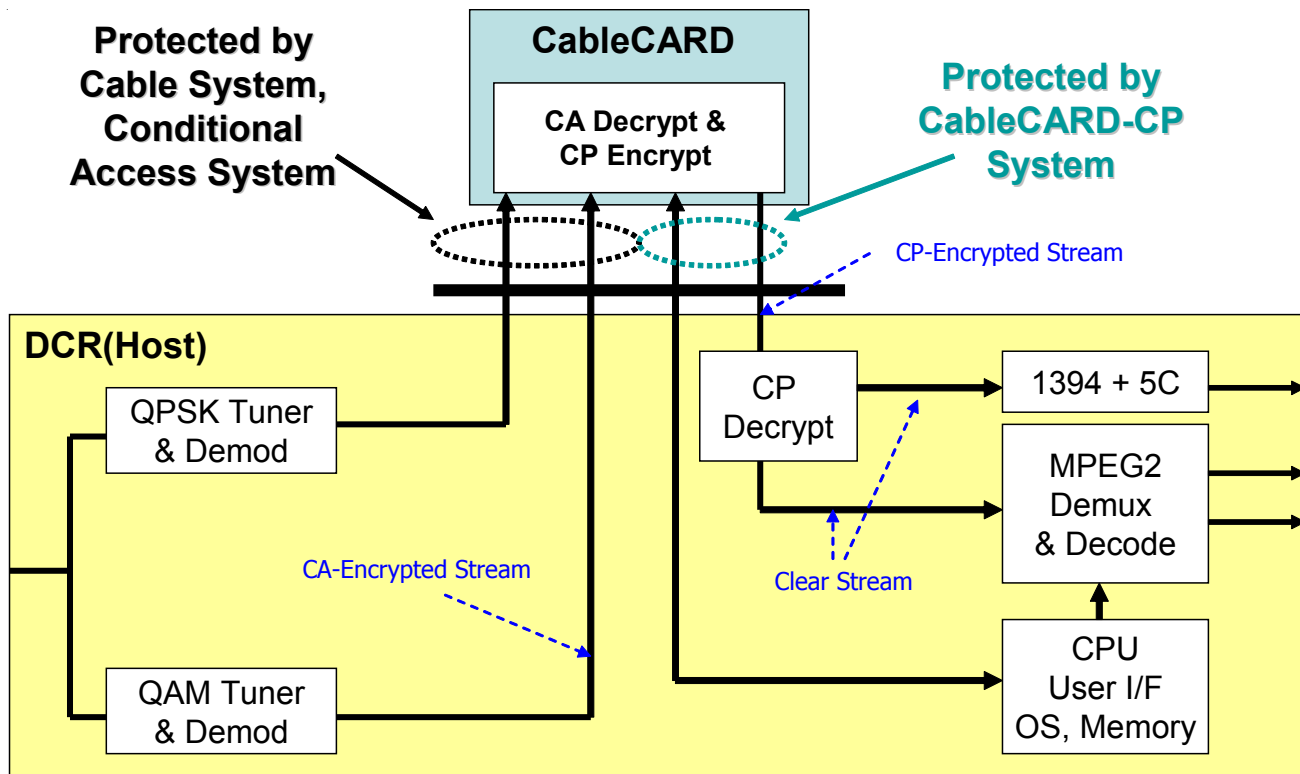


The OOB (Out Of Band) tuner runs all the time, locked to the frequency which it is given by the Cablecard. The data from the Headend should be on this frequency. If it is not, the tuner will not see the data nor will the Cablecard. EX: If the cablecard tells the unit to tune to 104.20Mhz. The unit will tune to 104.20Mhz and not search for other frequencies. If the MSO (Multi System Operator) has the cards programmed to give the unit a list of frequencies, the unit will search that list of frequencies to find the data and then lock. If the data is on 104.25Mhz, neither the unit nor card can get the data needed to receive a channel list and an authorization list, the CP and decrypt data. As a result, the unit will not be allowed to tune premium channels.

HOST-CABLECARD INTERFACE

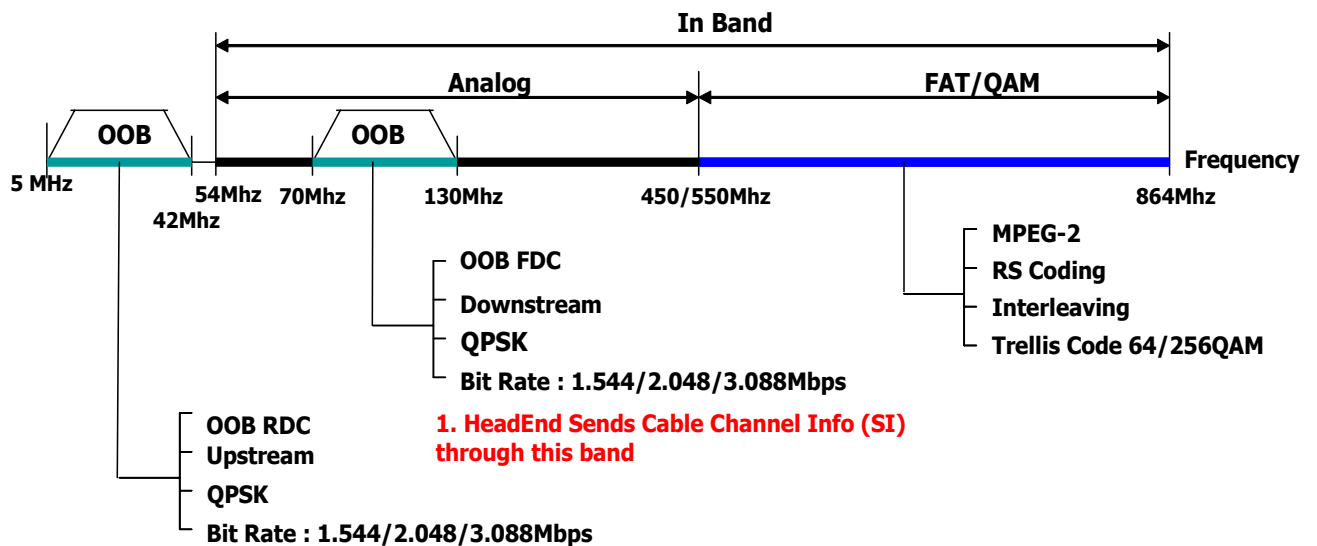
The data communication to and from the Cablecard and unit is encrypted. The Host (Unit) and POD (Cablecard) share a buffer so that the data from the headend is never lost. Some of the buffer is in the POD and some is in the host. The authorization list, CP data, Decrypt data and some other data is updated every 10 -20 seconds. This allows the cable company to add, remove, and rearrange channels as needed and the Cablecard is updated within seconds without the customer having to run EZ Scan to load new channels added to their lineup. The data from the headend is at regular intervals and can fluctuate in timing. This causes the data to flow at a higher rate at times and a lower rate at other times depending on other tasks the headend is performing on the system. The communication between the POD and host is a two way relationship. While the communication between the Cablecard and headend is only one way, from the headend to the card.

CABLECARD



Most but not all, CDTV (Cable Digital Television) channels are scrambled and or encrypted. Therefore decryption is a part of a premium package the customer pays for. There are a few channels the cable company has to provide as open channels. This allows the customer who purchases an HD ready TV that is capable of processing QAM to receive a few HD channels thru the cable system. In LG units there are two ways the channels are displayed, as 2 part channels (EX: 107-1) and as single part channels EX: 107. With the Cablecard inserted the CDTV map will show only single part channels. Without the card installed the CDTV map will show two part channels. Due to this it will be in the ASC's best interest to have a constantly updated channel lineup showing which are scrambled and which are open channels for all the headends in the area you service product. A good relationship with the local cable company is crucial to this so you are kept up to date with fast changing channel lineups. This can prevent you from trying to repair a product that is not defective. EX: The customer complains they no longer receive CH 186 which was Discovery HD a scrambled channel. The real cause is the headend moved that channel to CH 205 and CH 186 is no longer in the channel map. All this occurs through the OOB channel.

IN-BAND/OOB SPECIFICATION



1. DCR doesn't use this band because DCR has Uni-directional, downstream functionality only.

CABLECARD AUTHORIZATION & VALIDATION PROCESSES

- In order to activate CA service (called low-value service) and to receive Cable channel map, "Authorization process" is needed.
 - * Serial number and CableCARD ID are needed.
 - * During this process, CableCARD reset may occur.
 - * After this process is finished successfully, user can navigate cable channel map & can watch CA Encrypted services to which the user subscribes.
- In order to activate additional CP services (called high-value service), a "Validation process" is needed.
 - * Host/CableCARD ID is needed.
 - * HeadEnd sends Validation message through OOB channel.
 - * After Validation message is received by the CableCARD, the user can watch CP Encrypted services also.

DCR FUNCTIONALITIES

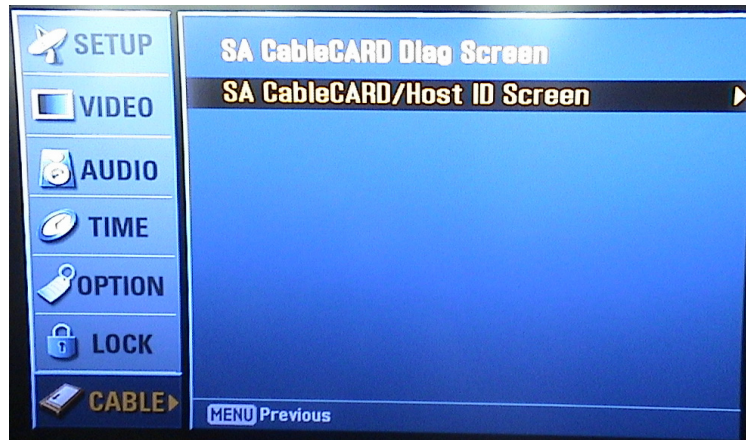
- Conditional Access Function
- Copy Protection Function
- Cable menu & MMI (Man Machine Interface) Function
- Digital Certificates
- CableCARD reset Function
- EAS (Emergency Alert System) Function
- Host Diagnostics Function
- CableCARD Firmware Upgrade Function
- Error Reporting Function

CABLECARD

CABLE MENU & MMI

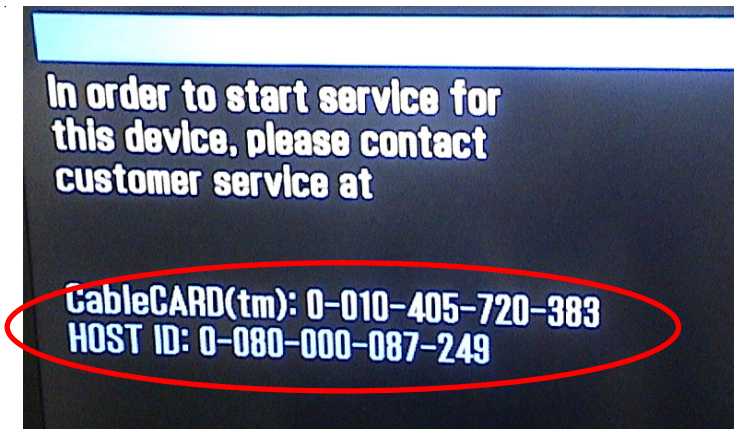
MMI = Man Machine Interface.

SA CABLECARD



Using Cable Menu, user can check status of various CableCARD functions. The lists of this menu vary depending on the CableCARD manufacturer.

MMI Example: SA CableCARD case

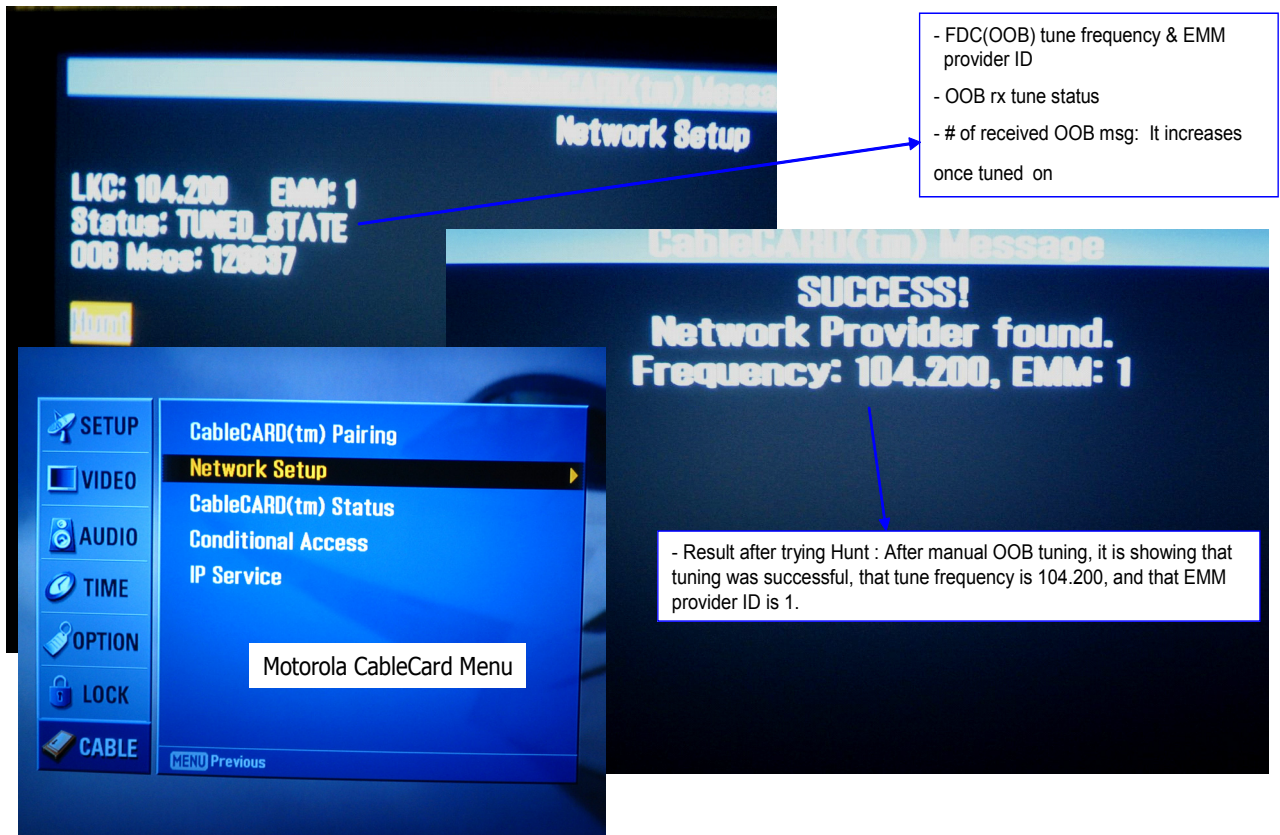


CableCARD uses MMI (Man Machine Interface) function to communicate with the user.

- CableCARD displays various user notification information through MMI window
- Host/CableCARD ID information

- the error reporting of Host's certification data.

MOTOROLA CABLECARD



Network Setup

LKC: 104.200 EMM: 1
Status: TUNED_STATE
OOB Msgs: 120037

CableCARD(tm) Message

SUCCESS!
Network Provider found.
Frequency: 104.200, EMM: 1

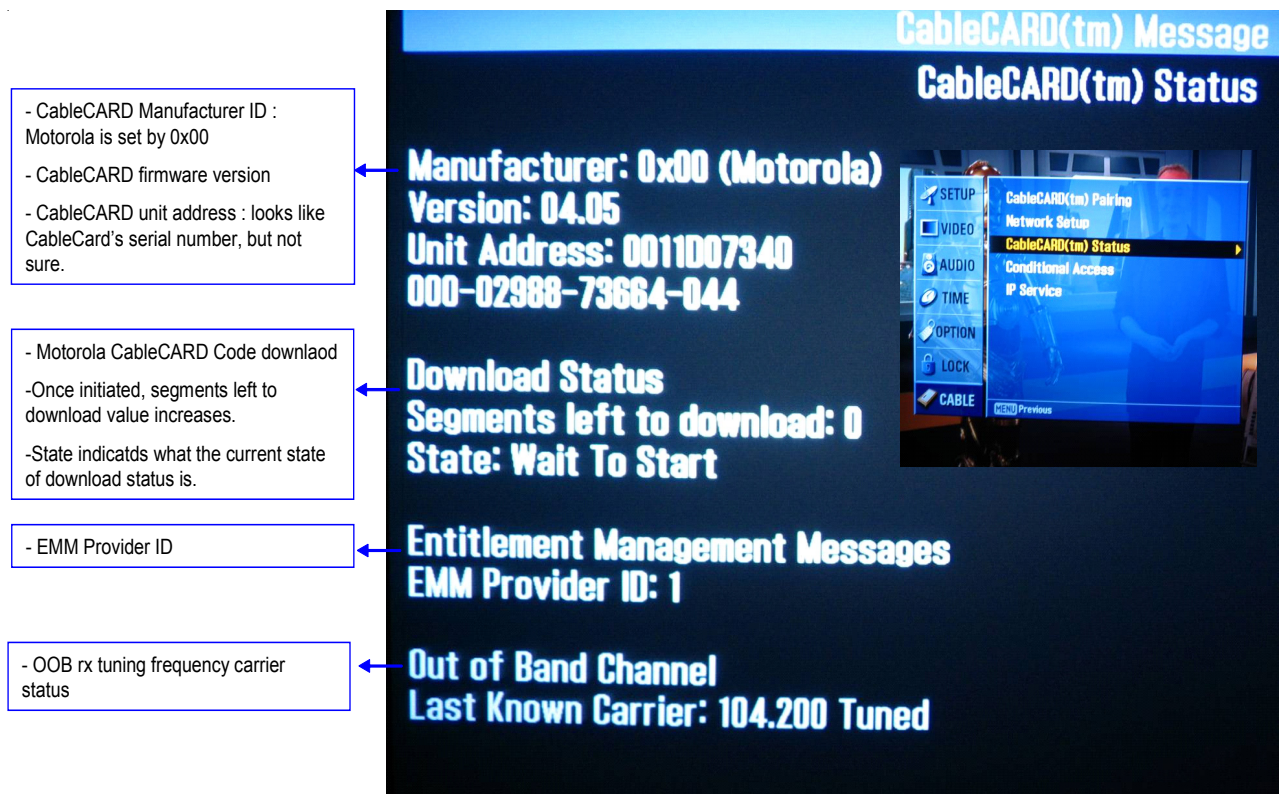
Motorola CableCard Menu

- SETUP
- VIDEO
- AUDIO
- TIME
- OPTION
- LOCK
- CABLE

CableCARD(tm) Pairing
Network Setup
CableCARD(tm) Status
Conditional Access
IP Service

MENU Previous

- FDC(OOB) tune frequency & EMM provider ID
- OOB rx tune status
- # of received OOB msg: It increases once tuned on
- Result after trying Hunt : After manual OOB tuning, it is showing that tuning was successful, that tune frequency is 104.200, and that EMM provider ID is 1.



CableCARD(tm) Message

CableCARD(tm) Status

Manufacturer: 0x00 (Motorola)
Version: 04.05
Unit Address: 0011D07340
000-02988-73664-044

Download Status
Segments left to download: 0
State: Wait To Start

Entitlement Management Messages
EMM Provider ID: 1

Out of Band Channel
Last Known Carrier: 104.200 Tuned

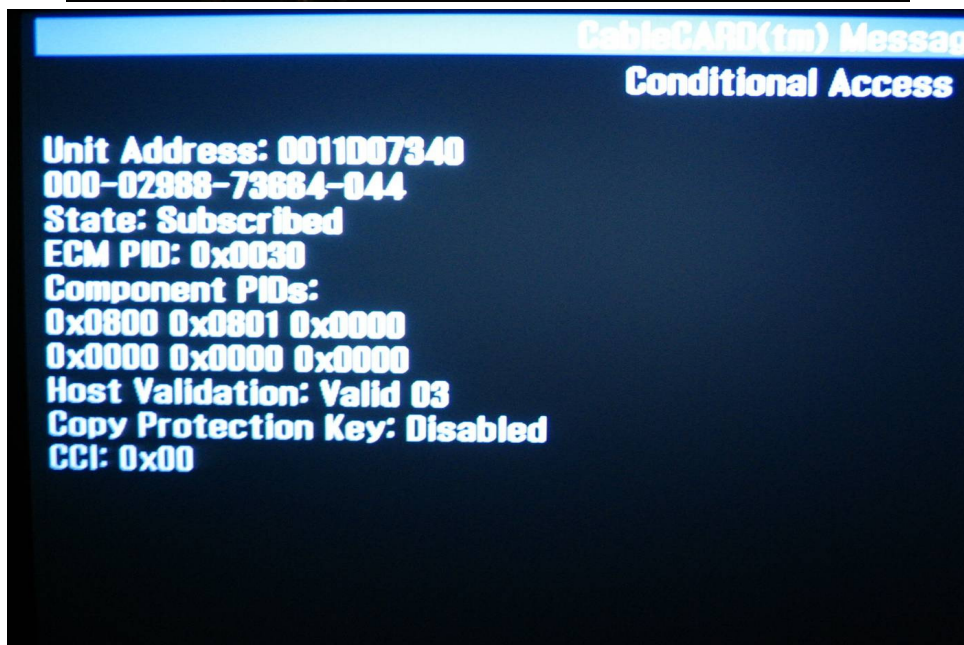
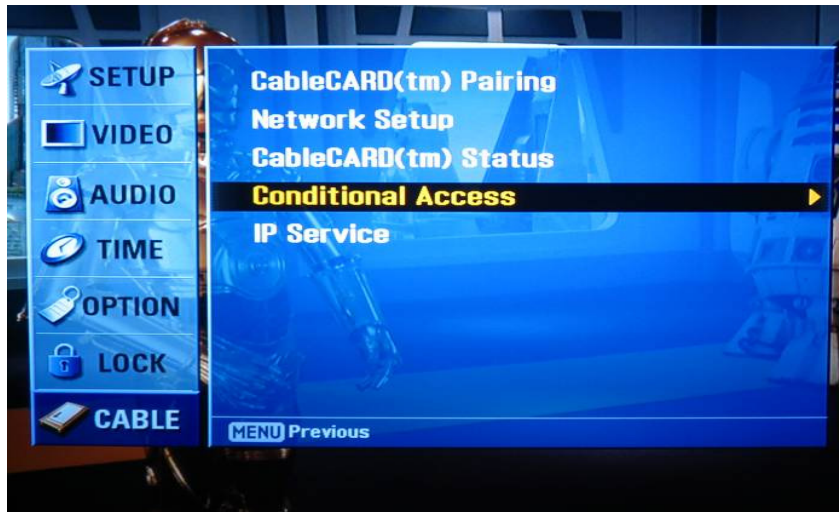
SETUP
VIDEO
AUDIO
TIME
OPTION
LOCK
CABLE

CableCARD(tm) Pairing
Network Setup
CableCARD(tm) Status
Conditional Access
IP Service

MENU Previous

- CableCARD Manufacturer ID : Motorola is set by 0x00
- CableCARD firmware version
- CableCARD unit address : looks like CableCard's serial number, but not sure.
- Motorola CableCARD Code download
- Once initiated, segments left to download value increases.
- State indicates what the current state of download status is.
- EMM Provider ID
- OOB rx tuning frequency carrier status

CABLECARD



- CableCARD unit address: This is the unit address the cable company will use to address data to this specific unit.
- State: CA Authorization. If subscriber already in subscription for the channel, it shows Subscribed. That is, it could be changed for each channel tuned.
- ECM PID from current channel.
- Component PIDs: video PID and audio PID of the channel tuned.
- Host Validation: CP validation status. The number shows validation trial counting, which is not related with channel.
- CP key: If CCI is non-zero, it becomes “enabled.” which means CP scrambler is functioning.
- CCI: CCI information from current channel. If CCI is zero, CP is not functioning.

The line item is channel specific. It is indicating that the channel presently tuned by the hosts tuner is a subscribed channel. This indicates that the Cablecard has received and authorization channel list. A copy Protection Key is presently disabled for this channel. This can change according to the actions taken by the headend.

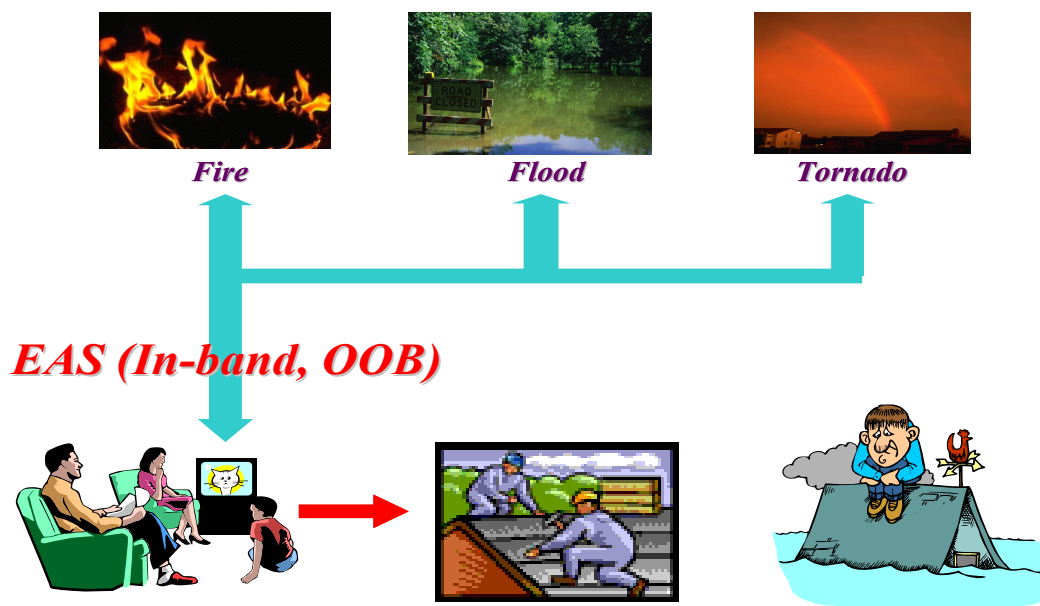
DIGITAL CERTIFICATES DATA

- Every TV and CableCARD has Digital Certificates Data to identify itself.
 - * Host/CableCARD ID is determined from the value of individual Digital Certificates Data.
- CableCARD side invalid Certificate
 - “Please call your cable operator and report an invalid CableCARD” error message will be displayed.
- DTV side Invalid or Without Certificate
 - “There was a technical problem during the authorization process. This production may have some component failure or may not be designed to be fully compatible with digital cable television service. Please contact the manufacturer or the retailer.” MMI message will be displayed.

CABLECARD RESET

- Whenever the DCR TV or CableCARD think the other device is in an abnormal state, a CableCARD reset will recover the Host/CableCARD interface.
 - * 161-xx technical problem case.
- There are normal states when the Host/CableCARD interface needs to reboot by way of a CableCARD reset.
 - * CableCARD firmware upgrade case.
 - * HeadEnd Authorization case.
- There are two types of CableCARD reset
 - * PCMCIA reset (Cold reset, H/W level reset)
 - * POD reset (Warm reset, S/W level reset)
- When the CableCARD reset occurs, and if the user is watching CA or CP Encrypted service at that time, video will freeze for about 20 seconds.

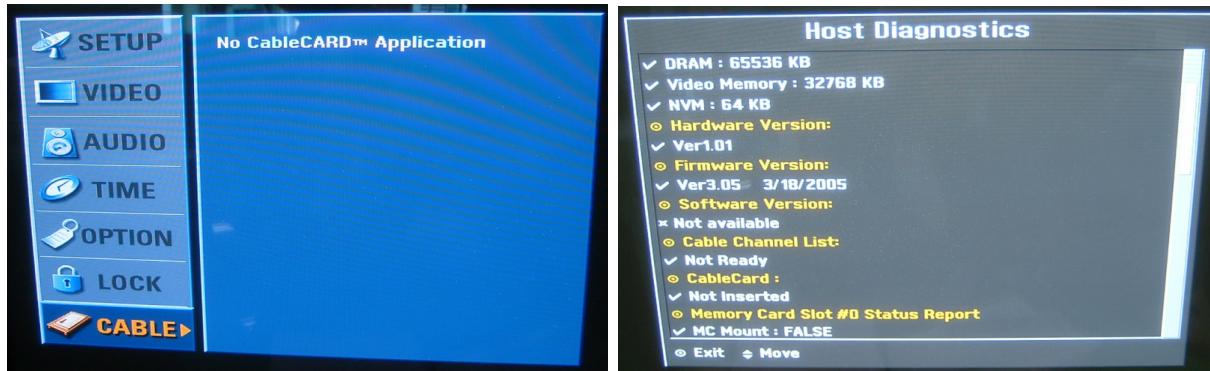
EAS (EMERGENCY ALERT SYSTEM)



CABLECARD

HOST DIAGNOSTICS

- To check the state of various TV functions related to the CableCARD, uses Host Diagnostic menu.
 - press Menu->CABLE->"0"->"0"->"0" to get into Host Diagnostics menu.
 - Cable Channel List's status
 - FAT, FDC status
 - H/W & F/W version



CableCARD Firmware Upgrade From the Headend to the Cablecard.

- When the CableCARD Firmware Upgrade is needed, HeadEnd activates CableCARD Firmware Upgrade operation.
 - * Delayed Upgrade mode (only at the stand-by state)
 - * Immediate Upgrade mode (stand-by or power-on state)
- CableCARD Firmware Upgrade shouldn't be interrupted by other operations.
 - * During this operation, a CableCARD Firmware Upgrade reporting message is being displayed and all remote control keys will be disabled temporarily.
 - * Only SA uses CableCARD Firmware Upgrade protocol and SA uses in-band tuner for this operation.
 - * Motorola uses their unique technique for the CableCARD firmware Upgrade and uses OOB tuner for this operation.

ERROR REPORTING

- Per the standard (SCTE28 Appendix E), in the case of pre-defined errors, the DCR should display an error message showing the 161-xx technical problem and/or set CableCARD reset to recover from this error.
 - * Failure mechanism is not the DCR but the CableCARD.
 - * "xx" digits are the index of this error.

A technical problem is preventing you
from receiving all cable services at
this time.

Please call your cable operator and
report error code 161-xx to have this
problem resolved.

CABLE CARD TROUBLESHOOTING

No	Error Condition	Failure Mechanism	No	Error Condition	Failure Mechanism
1	CableCARD READY signal does not go active.	CableCARD	13	LGE DTV response to open resource manager session response – resource manager unavailable	LGE DTV
2	LGE DTV reads incorrect CIS values	CableCARD	14	LGE DTV response to open resource manager session response – incorrect version of resource manager	LGE DTV
3	LGE DTV writes incorrect TPC11 E_INDEX value to POD configuration register	LGE DTV	15	LGE DTV response to open resource manager session response – resource manager busy	LGE DTV
4	LGE DTV sets data channel RS bit but CableCARD fails to set FR bit within 5 second timeout.	CableCARD	16	LGE DTV response to open resource manager session response – invalid status byte	LGE DTV
5	Host sets extended channel RS bit but CableCARD fails to set FR bit within 5 second timeout.	CableCARD	17	CableCARD fails to respond to profile_inq within 5 seconds.	CableCARD
6	Invalid buffer negotiation - CableCARD data channel (buffer size < 16)	CableCARD	18	LGE DTV resource response – no application information resource	LGE DTV
7	Invalid buffer negotiation – LGE DTV data channel (buffer size < 16 or greater than CableCARD data channel buffer size)	LGE DTV	19	LGE DTV resource response - no LGE DTV control resource	LGE DTV
8	Invalid buffer negotiation – CableCARD extended channel (buffer size < 16)	CableCARD	20	LGE DTV resource response - no system time resource	LGE DTV
9	Invalid buffer negotiation – LGE DTV extended channel (buffer size < 16 or greater than CableCARD data channel buffer size)	LGE DTV	21	LGE DTV resource response - no MMI resource	LGE DTV
10	CableCARD does not respond to Hosts open transport request within 5 seconds.	CableCARD	22	LGE DTV resource response - no low speed communications	LGE DTV
11	LGE DTV does not respond to CableCARD request to open resource manager session within 5 seconds.	LGE DTV	23	LGE DTV resource response - no homing resource	LGE DTV
12	LGE DTV response to open resource manager session response – resource manager non-existent	LGE DTV	24	LGE DTV resource response - no copy protection resource	LGE DTV

No	Error Condition	Failure Mechanism	No	Error Condition	Failure Mechanism
25	LGE DTV resource response - unknown resource identifier.	LGE DTV	37	CableCARD response to conditional access resource session - invalid status byte	LGE DTV
26	LGE DTV fails to respond to open session request within 5 seconds.	LGE DTV	38	CableCARD fails to respond to ca_info_inq within 5 seconds.	CableCARD
27	LGE DTV response to open application info resource session - application info non-existent	LGE DTV	39	CableCARD module requests to open copy protection resource session to the LGE DTV times out after 5 seconds.	LGE DTV
28	LGE DTV response to open application info resource session - application info unavailable	LGE DTV	40	LGE DTV response to open copy protection resource session - copy protection non-existent	LGE DTV
29	LGE DTV response to open application info resource session - incorrect version of application info	LGE DTV	41	LGE DTV response to open copy protection resource session - copy protection unavailable	LGE DTV
30	LGE DTV response to open application info resource session - application info busy	LGE DTV	42	LGE DTV response to open copy protection resource session - copy protection busy	LGE DTV
31	LGE DTV response to open application info resource session - invalid status byte	LGE DTV	43	LGE DTV response to open copy protection resource session - invalid status byte	LGE DTV
32	CableCARD module requests to open conditional access session to the Host times out after 5 seconds.	LGE DTV	44	LGE DTV does not support POD's copy protection system.	LGE DTV/CableCARD incompatibility
33	CableCARD response to conditional access resource session - conditional access non-existent	LGE DTV	45	LGE DTV and CableCARD do not mate	LGE DTV/CableCARD incompatibility
34	CableCARD response to conditional access resource session - conditional access unavailable	LGE DTV	46	LGE DTV response to CP_sync - LGE DTV busy	LGE DTV
35	CableCARD response to conditional access resource session - incorrect version of conditional access	LGE DTV	47	LGE DTV response to CP_sync - no CP support	LGE DTV
36	CableCARD response to conditional access resource session - conditional access busy	LGE DTV	48	LGE DTV response to CP_sync - invalid status	LGE DTV
			49	LGE DTV fails to respond to cp_open_req.	LGE DTV
			50	Invalid LGE DTV certificate	LGE DTV

No	Error Condition	Failure Mechanism
51	Write Error (WE) occurs after completion of any transfer from LGE DTV to Cable CARD	CableCARD or LGE DTV
52	Read Error (RE) occurs after completion of any transfer from Cable CARD to LGE DTV	CableCARD or LGE DTV
53	CableCARD fails to respond to any request within 5 seconds.	CableCARD
54	Invalid session APDU from LGE DTV	LGE DTV
55	Invalid session APDU from Cable CARD	CableCARD
56	Invalid SPDU tag from LGE DTV	LGE DTV
57	Invalid SPDU tag from CableCARD	CableCARD
58	Invalid APDU tag from LGE DTV	LGE DTV
59	Invalid APDU tag from Cable CARD	CableCARD
60	Transport ID from Host that has not been created and confirmed by POD	LGE DTV
61	Transport ID from Cable CARD that has not been created by LGE DTV.	CableCARD
62	Session ID from LGE DTV that has not been created and confirmed by Cable CARD	LGE DTV
63	Session ID from CableCARD that has not been created by LGE DTV.	CableCARD

CABLECARD

The following chart will help as a guide to troubleshoot Cablecard related problems.

Operation	Good Result	Else Problem
Plug in CableCARD™		
	Screen displays CableCARD Inserted	1) Re-insert card 2) Try another card >Defective card slot
Check Pairing Menu > Cable > CableCard Pairing		
	CableCard™: must not be all zeros	If all zeros, card defective
	Host ID: must not be all zeros	If all zeros, card defective
Check Channel List Ready Menu > "000"		
	Cable Channel List: Ready	Wait for download >No OOB data – goto diagnostic screen
Goto Diagnostic Screen Menu > "000"		
	OOB S/N > 10 dB	Bad signal
	OOB frequency = Between 70 and 130 MHz	

	FAT Status : SNR > 21 dB (64 QAM) SNR > 28 dB (256QAM) Carrier: Locked	Channel not receivable
Check OOB Function Menu > Cable > Network Setup		
	LKC shows frequency	
	Status: tuned state	
	OOB Msg: # should increase each time this screen is accessed	No OOB data signal
Check OOB Function Menu > "000"		
	FDC Status: FDC_SNR > 10 dB	Weak, distorted signal
	FDC Center Freq: 75.25 MHz or between 70 and 130 MHz	
	FDC Carrier: Locked	

Cable Operation Confirmation

- (1) Confirm that the Cable Card is inserted in the slot.
- (2) Enter the EZ adjust menu by pressing the Adjust key on the Service Remote Control (S R/C).
- (3) Go to number 2 Cable Check and press the Right key (%).
- (4) Confirm items below.

NAME	NORMAL	DEFECTIVE
Descrambler Check	OK	Not OK
CableCARD	CableCARD is removed	CableCARD is inserted
OOB Path	Locked - OK	Unlocked - Not OK
FDC_SNR	20bd or more - OK	Under 20db - Not OK
Video Signal	Normal Screen	Black Screen

CableCheck

- | | |
|---------------------|-----------------------|
| 1 Descrambler Check | OK |
| 2 CableCARD | CableCARD is inserted |
| 3 OOB Path | OK (Lock) |
| 4 FDC_SNR | OK (23 db) |

IN-HOME TROUBLESHOOTING

1. It is recommended that installers bring along a couple of CableCARDS for troubleshooting. This will help eliminate the CableCARD as a possible problem during the installation.
2. Before installing the CableCARD, installers should check that the Digital Cable Ready (DCR), also referred to as a HOST, is functional without a CableCARD.
 - a. Verify Host (TV) Operation: The installer can perform this by connecting the RF cable to the correct cable input of the DCR (there may be connections for a terrestrial antenna) and verifying good picture quality. The DCR will display all non~encrypted analog and digital content. (The DCR must not receive RF signal via an STB or accessory RF modulator.) This will eliminate basic TV circuitry as a possible problem.
 - b. Check that the CableCARD is inserted properly. When inserting cable card push carefully but firmly until you feel the card click into place.
 - c. Verify RF from Cable System Tap: The installer can also connect a cable set top box to confirm reception of encrypted digital services. This will help eliminate the RF signal as a possible problem,
3. If the first CableCARD installed does not result in a User Interface screen (also referred to as MMI screen) within 5 ~ 7 minutes, try unplugging the AC Power cord of the DCR and reconnecting it (to reset the DCR) then try to await coming out of the User Interface screen again. If this is still unsuccessful, try another CableCARD.
 - a. To eliminate the possibility of a damaged CableCARD or DCR device, the technician should look closely at the CableCARD device to ensure that none of the pinholes are blocked or clogged.
 - b. Check Host Interface. Using a flashlight, the technician should check the CableCARD slot on the DCR TV to ensure that there are no bent pins.
4. If the second CableCARD is successful, make sure the CSR or Dispatcher knows the new MAC ID and CableCARD ID to complete the installation. The original card should be marked accordingly and returned for repair.
5. Check the CableCARD menu options. If the second CableCARD fails to bring up the User Interface screen, the technician should refer to the diagnostic menus on the DCR for further troubleshooting. The technician can pull up the User Interface screen manually through the menu choices. The customer should provide the User Manual, so the technician can easily navigate through the DCR TV menu screens. The table on the next page describes how to navigate the CableCARD menu. The list of selectable CableCARD options will vary, depending on your cable service provider or CableCARD manufacturer. The table also shows how to access diagnostic screens for the DCR TV. Many of these screens are not described in the User Manual.
6. If the second CableCARD is successful, make sure the CSR or Dispatcher knows the new MAC ID and CableCARD ID to complete the installation. The original card should be marked accordingly and returned for repair.

7. Check the CableCARD menu options. If the second CableCARD fails to bring up the User Interface screen, the technician should refer to the diagnostic menus on the DCR for further troubleshooting. The technician can pull up the User Interface screen manually through the menu choices. The customer should provide the User Manual, so the technician can easily navigate through the DCR TV menu screens. The table below describes how to navigate the CableCARD menu. the list of selectable CableCARD options will vary, depending on your cable service provider or CableCARD manufacturer. The table below shows how to access diagnostic screens for the DCR TV. Many of these screens are not described in the User Manual.

CableCARD Mfg	Diagnostic Type	1st key	2nd key	3rd key
ALL	CableCARD main menu	MENU	Use cursor to select CABLE icon then press ENTER	N/A
Motorola	CableCARD pairing status	MENU	Use cursor to select CABLE icon then press ENTER	Use cursor to select CableCARD Pairing option, press ENTER
Motorola	Network status	MENU	Use cursor to select CABLE icon then press ENTER	Use cursor to select Network Setup option, press ENTER
Motorola	CableCARD status	MENU	Use cursor to select CABLE icon then press ENTER	Use cursor to select CableCARD Status option, press ENTER
Motorola	CA status	MENU	Use cursor to select CABLE icon then press ENTER	Use cursor to select Conditional Access option, press ENTER
NDS	CableCARD pairing status	MENU	Use cursor to select CABLE icon then press ENTER	Use cursor to select CableCARD Pairing option, press ENTER
NDS	Network status	MENU	Use cursor to select CABLE icon then press ENTER	Use cursor to select Network Setup option, press ENTER
NDS	CA status	MENU	Use cursor to select CABLE icon then press ENTER	Use cursor to select Conditional Access option, press ENTER
SA	CableCARD Diagnostics	MENU	Use cursor to select CABLE icon then press ENTER	Use cursor to select SA CableCARD Diag option, press ENTER
SA	CableCARD pairing status	MENU	Use cursor to select CABLE icon then press ENTER	Use cursor to select SA CableCARD HOST ID option, press ENTER
SA	CableCARD Copy protection information	MENU	Use cursor to select CABLE icon then press ENTER	Use cursor to select SA CableCARD CP Screen option, press ENTER

8. If the installer is still having a problem, the installer should report the problem to the MSO headend dispatcher for troubleshooting. If the cable company dispatcher (headend personnel) has completely checked their channel set-up, confirmed the accounting/billing system to setup is correct, and has confirmed normal channel map with one or more other DCR TVs at the MSO headend, then go on to the next step,
9. If the installer determines that the DCR device is the problem (unit failed either item 2a or 3b above) and can go no further in correcting the problem, and if the installer determines that the host-pod pairing screen cannot be displayed with multiple CableCARDs, he or she should follow the directions given by the CE manufacturer in informing the customer of their options, The customer should start by contacting the CE manufacturer directly for assistance and/or repair information. In many cases, if the HOST is under warranty, the repair will be done at the customer's home when possible.

CABLECARD

9. If using an STB will allow the customer to receive services on the damaged DCR device, the installer can leave a box in the customer's home until the customer resolves the issue with the CE manufacturer.
10. If the technician is able to install the CableCARD device and access the User Interface screen (also referred to as MMI screen), and has relayed the information to the dispatcher, but is still not receiving encrypted programming, this programming may be protected through the use of copy protection directive. Ensure that the information passed to dispatch is correct. Relay again the Host ID, CableCARD ID and Data ID (Motorola only). Dispatch will send a hit to the CableCARD once the information is checked and verified. The CableCARD must be paired to the Host before copy protected programming can be displayed. Note that it may take several minutes from the time dispatch sends the authorization before it reaches the DCR device. The MMI screens should be checked to verify if the authorization has been received. For SA systems the host-pod pairing screen should say "Authorization Received." For Motorola the Conditional Access MMI State parameter should say "Subscribed". (These should be verified by POD Manufacturers or cable companies.)
11. To confirm the Headend Validation for displaying the encrypted channel, the technician should check the CableCARD menu. For SA systems, the CableCARD Copy Protection Information menu should say "Authorization Received". For Motorola systems, the Conditional Access menu should say "Valid xx (2 digit)".
12. If encrypted programming is still not displayed, installer should check the status of followings.
 - a. Cable Channel List: Ready
 - b. CableCard: Inserted
 - c. FDC status (OOB Status): Lock
 - d. SNR(Signal to Noise Ratio): higher than 12 dB is normal range,

The table below describes how to check status in the LG DCR TV.

CableCARD Mfg	Diagnostic Type	1st key	2nd key	3rd key	4th key	5th Key
ALL - works with any CableCARD	Host Diagnostics (In Band Signal Status, OOB Signal Status, etc)	MENU	Use cursor to select CABLE icon	Press button 0 (zero)	Press button 0 (zero)	Press button 0 (zero)

CABLECARD TROUBLESHOOTING

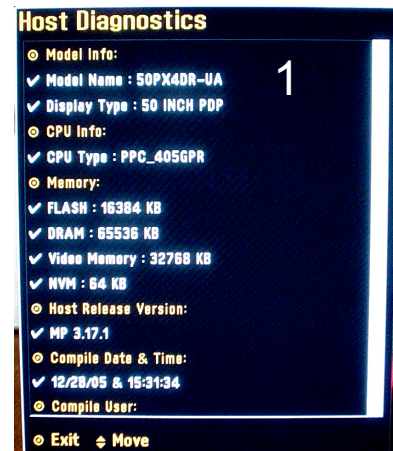
HOST DIAGNOSTICS

This Menu is only active on Cablecard ready units.

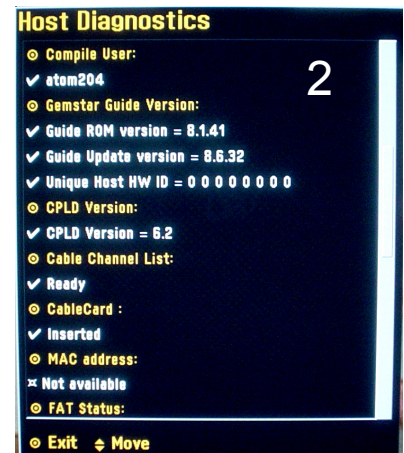
Accessing Host Diagnostics:

1. Press Menu on the customer's remote.
2. Press the up or down arrow key to highlight CABLE.
3. Press the 0 key three times. Scroll up and down this menu by using the up and down arrow keys.

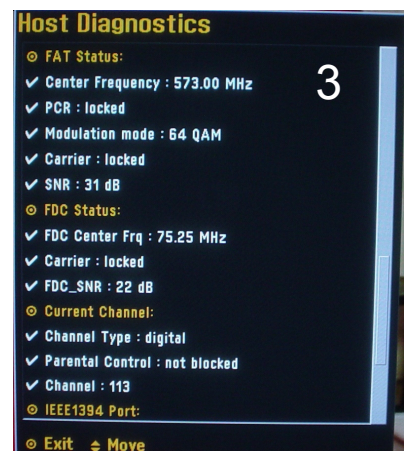
The model info gives the factory model information also used to access the debug menu for software updates. Memory shows the available memory in the unit for video and audio processing and Cablecard functions. Host release is the present software revision in the unit.



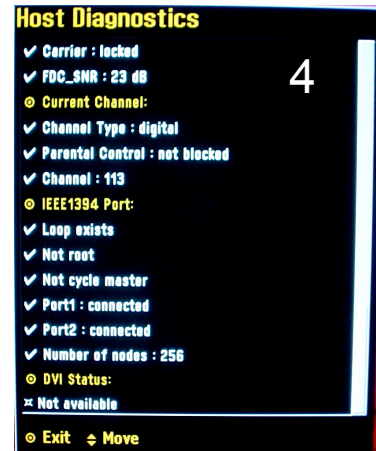
Gemstar Guide Version gives the original version of Gemstar in the unit when installed. Guide Update Version is the latest version of Gemstar loaded into the unit by Gemstar. Cable Channel List gives the status of the list of available channels in memory, with a Cablecard installed this should always display Ready. Cablecard indicates if the cablecard is inserted. If the Cablecard is inserted and the unit does not indicate that it is. There could be an issue with the Cablecard itself or with the programming in the card. Once this has been eliminated as the cause. The card slot or Digital PCB could be the cause.



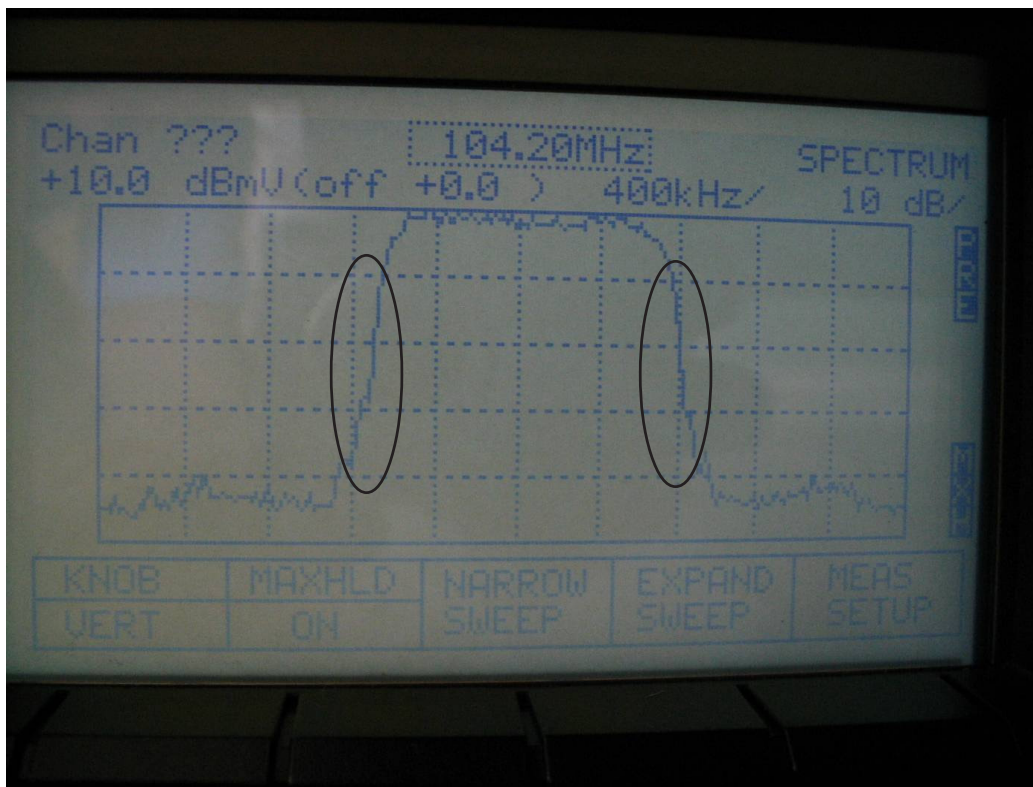
FAT Status tells the frequency of the presently tuned channel as well as the modulation QAM 256/64, digital, analog. Carrier locked indicates the carrier is locked on the center frequency. SNR gives the (Signal to Noise Ratio) of the present signal tuned. FDC is your (Forward Data Carrier) this gives the state of the OOB signal thru which the Cablecard receives data from the headend. It indicates the center frequency that the card told the unit to look at to find the signal. Carrier indicates the unit has the carrier locked or not locked. This must be locked for the Cablecard to operate. FDC_SNR gives the (Signal to Noise Ratio) for this OOB signal. Current Channel shows the channel type Digital or Analog as well as the Parental Control setting for this channel and the channel number.



This indicates the state of the IEEE1394 and DVI ports and connection settings.



The meter below shows we are looking for 104.20Mhz. What we find is the signal is shifted slightly. This indicates the signal is not centered on 104.20Mhz. The OOB tuner is told to look for the data on 104.20Mhz but the data is actually on 104.25Mhz. This is enough shift to prevent the card from receiving the data it needs from the headend. This signal is not allowed this much variation.



TV GUIDE

OVERVIEW



- ① Video Window - Displays TV video while The TV Guide On Screen system is displayed.
- ② Service Bar - Provides access to the 5 main Guide Services.
- ③ Current Service Label - Indented to indicate current Service displayed.
- ④ Tile - Displays show title.
- ⑤ Highlight - Indicates an active tile.
- ⑥ INFO Box - Provides information for a highlighted item.
- ⑦ INFO Button - Indicates you can cycles through the various Info Box sizes.
- ⑧ Channel Logo - Identifies network.
- ⑨ Record/Remind Icons - Indicates a show is set to Record or set as a Reminder.
- ⑩ Panel Ad - Location where show- or product-specific information appears (and also where Panel Menu appears).

OPERATION

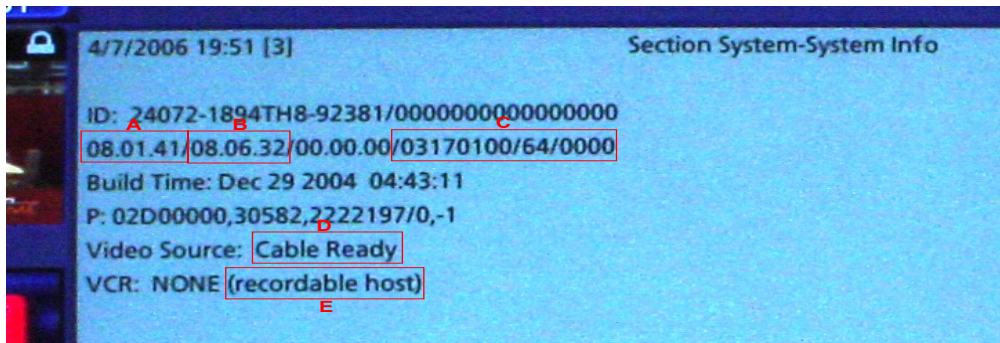
TV Guide is a free service and is provided by Gemstar. TV Guide can be received OTA (Over The Air) thru an antenna. It can also be received thru cable service. OTA and thru the cable there must be a strong signal on the local ABC and PBS channels for TGOS to operate properly. An antenna can be purchased to retrieve signals as far as 150 miles away and some even further. This is only a good idea for customers far away from any city. The reason is if the customer receives several ABC's and PBS broadcasts the unit will receive program data from more than one area, thus there will be a lot of incorrect program listings and errors.

TV GUIDE

If the customer has a unit with TVGOS and requires a cable box due to PPV (Pay Per View) or VOD (Video On Demand) and they desire to use TVGOS they will have to split the cable from the wall. One leg of the splitter will have to go to the cablebox and the other will have to go to the TV. Auto programming or EZ Scan will have to be run to load PBS and ABC channels into the unit. Any other connection can be used from the cablebox to the TV. If the TV cannot see ABC and PBS broadcasts with it's own tuners, TVGOS will not be downloaded to the unit. The cable box, if connected via coax cable, will only allow the TV to be tuned to channel 3 or 4.

NOTE: If the unit has been setup as if it has a cable box in TV Guide, the channel map and G-Link are also setup in TV Guide. The channel map will only see channels 3 or 4 and these are the only channels the unit will tune. If the cable box is removed, setup in TV Guide will have to be reconfigured without a cable box. This will allow the unit to tune channels other than just 3 or 4. Also, the channel map in the unit will show all channels it is authorized to see.

SYSTEM INFO



To access this menu from the TVGuide screen highlight SETUP at the top of the TVGOS screen press the down key once to highlight CHANGE SYSTEM SETTINGS and press 753159852. The screen above will appear. In Box (A) you can see the original version of Gemstar software the unit had when it was built. Box (B) you can see the version the unit has been updated to. To the right of box B, this will display the version when the unit receives an update again from Gemstar. Box (C) is the coding Gemstar uses for the programming area the unit has been programmed for. Not all zip codes have the same or different cable provider and OTA (Over The Air) programming. As a result several zip codes can have the same code and programming. Box (D) tells what input the TV was programmed to look for the TVGOS signals and that the customer set it up as cable signal as the type of signal being supplied to the TV. If the only signal supplied is OTA, this would say ANTENNA. Box (E) saying

(recordable host) is letting you know the unit has the ability to record programs without the need or use of any other device. This unit has an HDD (Hard Disk Drive). If the unit was setup for a VCR to be used as the recording device then, this would display VCR. This will assist you in quickly determining if the customer has made an error in setting the unit up correctly.

4/7/2006 19:52 [3] Section Reception-Slicing

	Since Cold	HostChan	CurrChan
Starts	188723	188723	10631
Ends	188539	188539	10611
Drops	43	43	1
NoBufs	0	0	0
AOver	0	0	0
BadPMW	0	0	0
BadBuf	0	0	0
TypeA	0	0	0
ACorr	0	0	0
AErrs	0	0	0
TypeB	139904	139904	8002
BCorr	27	27	2
BErrs	6	6	0
COver	0	0	0
TypeC	48617	48617	2609
CCorr	2	2	0
CErrs	0	0	0
CBad	166	166	17

Access this screen by using the up or down key and scroll Section Reception Slicing. This screen shows Type A, B, and C. Type A is not used in these units. You are only concerned with type B and C. Type B comes in on the vertical sync of you local ABC broadcast. Type C comes in on the vertical sync of your local PBS broadcast. The numerical values indicate the data sections the unit has received. If the value by type B or C is 0, this indicates either the channel reception is poor or there is a problem with the Gemstar equipment at that station. This equipment is not the responsibility of the station to maintain. Gemstar is responsible for their equipment. B CCorr indicates type B and C data corrections that have occurred. Band CErrs indicates the errors in the data that has been received. CBad indicates the the bad data that has been confirmed only for type C.

SYSTEM FLOWCHART

TV Guide On Screen (TVGOS) Setup

